RAILROAD GAZETTE

FRIDAY, APRIL 18.

New Standard Fish-Plate of the Pennsylvania Railroad.

An apparently slight change in the standard fish-plate of the Pennsylvania Railroad has just been made (on April 15,) which is shown in another column and may contain a valuable suggestion for officers of maintenance of way on other lines. It is simply a change in the position of one of the slots or recesses for the spike from the point, *A*, where it stood in the standard heretofore in use, to the point where it is shown in the cut, nearer to the end of the angle plate. The effect is to "stagger" the spikes in the joint ties instead of bringing them directly opposite to each other—something which is always carefully avoided, in good practice, in driving spikes, but which was unavoidable at the joint-ties with the former standard.

The effect of both the new and old standard will be clearly seen by imagining a duplicate of the splice-plate shown in the engraving to be reversed to go in the back side of the rail.

Contributions.

Folding Doors for Portals of Tunnels.

NEWPORT, R. I., April 9, 1884.

TO THE EDITOR OF THE RAILROAD GAZETTE:

In your issue of April 4 you make mention of the closing of the Bozeman Tunnel on the Northern Pacific Railroad by folding doors. It may interest some of your readers to know that folding doors have been used at the two ends of the Hoosac Tunnel for some years, those at the "West Portal" having been in use since 1878, if not earlier. The doors at the "East Portal" were erected in the fall of 1882, when the second track was laid through the tunnel. Previous to the erection of these doors immense icicles formed on the roof and sides of the tunnel, which were very dangerous to trains and a serious damage to the brick arching. It was necessary to keep men employed day and night in breaking down this ice, Since the tunnel has been closed at both ends during the cold weather there has been comparatively little trouble from ice. N. W. EAYRS.

[This is especially interesting as showing that the ventilation of even so long a tunnel as the Hoosac is not so serious a problem as to forbid shutting off the natural draft by means of the doors mentioned. It may not be generally known that in the early days of railroads it was one of the serious arguments against them that they could not be built without tunnels, and tunnels could not be used by locomotives if of any length. This argument was one of those which caused the use of inclined planes on the Liverpool & Manchester without even an attempt to use locomotives.—EDITOR RAILROAD GAZETTE.]

"The Gravest Defect of Maintenance of Way."

TO THE EDITOR OF THE RAILROAD GAZETTE:

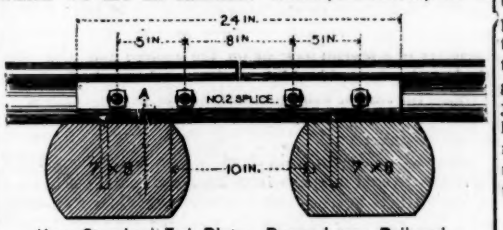
In your issue of the 28th ult. there appears an editorial article entitled "The Gravest Defect in Maintenance of Way," in which the opinion is expressed that the defect of all others and one that can be easily recognized even on first-class track is a lack of uniformity in the level of the rails. To this defect is charged "almost every jolt and impact which is sufficiently noticeable to be separately distinguished." Undoubtedly there is in the track of the best regulated roads this lack of uniformity in the level of the rails, but I do not think so large a percentage of the total amount of money spent by railroads for renewals and repairs of track and rolling stock can as rightly be charged to this defect as to the inherent weakness of the joints and the evils that follow therefrom.

With all the progress made in applying scientific principles to the care of track in ballasting and ditching, and in the shape of rails and splices there still remains the fact that it is seemingly impossible to maintain at the joints so perfect a bearing of the rail bases on the ties as to prevent a movement toward depression. The settling of the ties in their beds or the slow but uneven cutting of the rail bases into the ties results in imperfect bearing or support and throws the strain, when the weight of a passing train is imposed, on the plates and bolts. Slight elongation of the bolts and subsequent work and wear of the parts gives greater freedom of movement, so that under the weight of the wheel the joint depresses, forming a diminutive valley. The wheel under momentum does not follow the line of depression which it makes by its weight, but jumps just before reaching the end of one rail, and landing on the other a little back of its extremity, deals a blow which in its effect is "sufficiently noticeable to be separately distinguished" by any one riding in the train. The condition of most rails which have seen service shows that these wheel-jumps are of frequent occurrence, and that the blows dealt are severe; for there will be found a hollowed and flattened spot just back of their ends where the wheels have left their mark. To these jumps and blows of wheels battered rail-ends can be attributed without question, and I also think that the larger part of the infinite variety of necessary repairs to rolling stock is due to the resulting shocks. Hence there must be a *close and constant watching* of the rail-joints. Whether this can ever be entirely obviated, it is not easy to predict. Possibly some relief may come from the use of iron or steel rails.

The annoyance caused by the *rattle* which the loosened parts of improperly supported joints give forth has led to the adoption of methods for relief which tend to quiet the noise rather than to strengthen the joints. The wisdom of this policy, which finds expression in the demand "for something elastic at the joints," is worthy of discussion; to conceal a weakness by quieting its complaint is by no means curing it.

But the point which I wish to make is: That *yielding joints*, and not lack of uniformity in the level of rails, are the chief cause of the jolts and impacts noticeable on moving trains. F. H. HOWES.

[What the chief causes of bad-riding track is of course is a matter of opinion. Joints are a weak point in all tracks, undoubtedly, but the jolts and impacts to which we referred are not such as occur every 30 ft., but such as are "especially" noticeable. We referred also to track that can be called good, or fairly good, for high passenger speeds. On modern track of this class we do not think it is true that joints cause jolting and impact more than any other defect, although they do cause more noise and more expense to keep up. That "the larger part" of repairs to rolling stock is due to bad joints is a singular proposition. Mr. Howes correctly states the very curious manner in which steel rails wear at the joint, and which sufficiently proves that there is a considerable jump at every joint. We believe, however, that this effect is much less with heavier rails and angle fish-plates; and, measured by the length of time required to wear any material depression in the rail, the effect of each single jolt would not naturally be much greater than the quiver of the springs and disagreeable rattle with which we are all familiar. Joints, moreover, are a



New Standard Fish-Plate—Pennsylvania Railroad.

necessary evil which cannot be cured. We will readily admit that absolutely continuous rails would be a greater boon than absolutely level track.—EDITOR RAILROAD GAZETTE.]

The Worst Defect of Track Again.

ERIE, April, 1884.

TO THE EDITOR OF THE RAILROAD GAZETTE:

In your article of 4th inst., "The Worst Defect of Track Once More," the third paragraph reads thus:

"It is true enough that the use of the spirit level is greatly neglected by section foremen—far more generally neglected than the managers of the track department, or even road-masters in immediate charge have any idea of. A partial remedy for this, no doubt, can be found by impressing upon section-men that the level must be used and giving them positive orders, which they will be unlikely to disregard."

I expect to see a number of road-masters come forward in self-defence in regard to this subject.

In February, 1879, I took charge of the Buffalo Division of the Lake Shore & Michigan Southern. It was, as you recollect, a very severe winter, with a large quantity of snow in this locality; consequently, the track was very rough (caused by heaving), and looked a trifle discouraging to me. I first had the required number of good track-levels made, and started a competent man at Buffalo to get the levels of both tracks at every 100 ft.; also the section of road-bed and ditches. The book in which these levels were recorded is a valuable relic.

Having the above data to work from I began the work understandingly, and during the year 1879 made a great improvement in the riding of the track, as the levels subsequently taken indicated, as well as favorable comments from my superiors. I attribute it, to a great extent, to the use of the track level. By pursuing the same course in 1880, the result was highly gratifying. I do not wish to be understood that the track was all level; it was not, and never will be, but it was in good shape and riding nicely.

In September, 1881, I was given the Erie Division, located between Erie and Cleveland, thus giving me the track from Cleveland to Buffalo. In 1882 and 1883 we ballasted the entire Erie Division, excepting four miles, with a very fine quality of stone gravel, and I think a glance at it would convince the most skeptical that the track-level was recognized.

I infer that you consider it difficult to enforce the use of the track-level with section foremen. I find that I can convince them of the importance of the level and do enforce the use of it. I do it in this way:

I give the foreman an order to surface a certain piece of track and report when done, thus settling the matter of giving orders until report is received. In the meantime, I will discover one or more points on the piece of track in question that are not up to the standard, and note the location. When the foreman reports the work completed, I see him and ask if it is all level. If it be his first attempt, he will invariably answer, "Yes, sir." I ask him to take his level and we will examine the work. We walk along, leisurely, until we reach one of the points that I have noted, I generally find the worst place first. He applies his level and finds it an inch, perhaps, or more out of level. To say that he is despondent would hardly describe it. I ask him if he doesn't think he can do better. If he possesses many of the qualities that I care to waste time in training, he will answer he can and will do it. If I catch him a second time, unless his excuse is good, it will be stormy. We do not discuss the subject a third time.

If I cannot get to the piece of track, I send a man to take the levels after the foreman has finished it. This has a good effect, as he will think that there are doubts about his work being first-class.

I like my mode of keeping account of the daily work of a section gang. I furnish memorandum books in which the foreman notes what is done each day, sending me the book at the end of the month. Each foreman has two books, so that I have the February book in my office from the 1st to the 26th of March, thus enabling me to review the previous month's work at my leisure. In these, the foreman notes the number of feet of track ballasted or surfaced, by raising one rail or both, as the case may be, giving location. Thus, you see, I can test the use of his level at any time.

As the track-level is acknowledged to be indispensable in putting up track by men who have the proper interest in their work, perhaps a few words in regard to frost would be appropriate.

Frost is undoubtedly one of the worst elements we have to battle with, in regard to track getting out of level. We cannot prevent the heaving, but we can, to some extent, control the action of frost on the track by keeping good drainage, good width of road-bed, say 30 ft. wide for double track, evenly trimmed so as to prevent irregularities, either in road-bed or side slopes, thus exposing to the frost an even surface. In this way we get uniform heaving of track, so far as it is in our power to control it.

I do not think your theory of attaching a large level to the hand car to determine the level of the track will work practically. I have experimented to some extent with my track-levels by laying one on the hand car and also by laying the level on a spring seat that I have on a car. The latter gave the better result, but both are unsatisfactory, as the jar, unless the speed is at the rate of four or less miles per hour, agitates the liquid so as to separate the bubble, thus making it unreliable. True, my levels are rather sensitive, more so than those you recommend; but I think they give the same practical result. W. H. COURTNEY,

Road Master Eastern Division L. S. & M. S. Ry.

[As it happens, it was in riding over Mr. Courtney's own track, with its Western connections, that the last of those little "experiments," suggested in the article which called out Mr. Courtney's letter, was made. It is true that the track is very good. We think Mr. Courtney must in his turn admit that, in spite of his exceptional care, its imperfections of level are the worst defects it has. If not, what are they?

To apply a level to any form of hand-car so that it will work satisfactorily is undoubtedly difficult, and will require some little "cutting and trying," as we said. The only possible way is by some form of light, small spring at each end which shall just take up the jar, and no more. It can be done, we have little doubt, but it cannot be done off-hand, the first time.

Even supposing this done, the fact will still remain that the hardest defect to cure in track is the most insufficiently provided with checks to reveal deficiences—but it will not be as bad as now.

We do not see that road-masters have any call for "self-defence" in the matter. We simply stated that no vigilance of the road-master could be as effectual as some constant check which would reveal all deficiencies as soon as they occur and which would enable them to be compared with each other without trouble or loss of time, so that the worst could be cured first. Is not this true?

The system of reports of work done each day, mentioned above, is a truly excellent plan if faithfully carried out.—EDITOR RAILROAD GAZETTE.]

Author's Reply to Review of "Electric Propulsion."

TO THE EDITOR OF THE RAILROAD GAZETTE:

Pray accept my thanks for the exhaustive review of my article upon the application of electric propulsion to the elevated railroads of New York city.

While I must dissent generally from your strictures, I admit their justice in one or two particulars, and am especially gratified that my views should have appeared of sufficient importance to merit the attentive consideration they have evidently received. If you will grant me space to reply to some of the exceptions I shall count myself uncommonly fortunate.

You seem to have no objection to the method of reasoning, but conceive that my conclusion is reached through the adoption of erroneous values; or, in your own words, underestimating "the power required under the present system, and the cost of generating this assumed, but insufficient, amount of power by the stationary engines and dynamos."

Your epitome of my original communication gives the gist of it—although coefficients of traction of 0.004 and

0.006 are nearer 9 and 13.5 than 8 and 12 lbs. per ton—and the first point on which I would join issue is the assertion that the measure of maximum work performed by a locomotive is the effort exerted in pulling a train in motion. The fallacy is a most plausible one, but not difficult to be proved a fallacy.

Mechanical work consists of force and distance—pressure and space—and in the absence of either factor no work is accomplished. No amount of pressure will create work until motion ensues, and it is an absurdity to impute horse-power to a quiescent locomotive. The boiler pressure may increase to the limit of safety, and the pull of the locomotive be never so great as at the instant before motion is established, but up to that moment no exterior mechanical work has been performed, as the space factor is zero. With the inception of motion the pull of the locomotive—or coefficient of traction—tends to assume its normal value; the space factor is measurable and horse-power may be calculated, but not until then. Further, the work then performed is the totality, and such are the only conditions in which work is possible. The product of the diminished motion of the pistons, before the train has gathered way, and the accumulated boiler pressure, is an equivalent to the rapid motion and reduced pressure when the normal train speed is established. Does combustion go on faster when a locomotive is standing still? Rather the reverse.

In view of my position on this point it becomes unnecessary to analyze your calculations or to comment on the reasoning which leads you to compute the "total average power exerted at any one time by the engines at work on the elevated railroads" at "somewhat over 12,500 horse-power." There is no common premise to argue from.

If your theory is correct, it concedes an immense advantage to electric propulsion, which Sir William Siemens thus indicates in his description of the Berlin Railway: "It is a remarkable circumstance in favor of the electric transmission of power that while the motion of the electro-magnetic or power-receiving machine is small its potential of force is at a maximum, and it is owing to this favorable circumstance that the electric train starts with a remarkable degree of energy."

I note one patent error that you have adopted, which is attributing a speed of 30 miles per hour to the elevated trains in question; the maximum is rarely 20. You also have misapprehended the principle of my elimination of the influence of grade in calculatiug the total work of moving them.

I do not assert that "undulating grades make no difference in the average resistance or coal consumption"—although it is not an extravagant surmise that a locomotive could be so manipulated as to compass such a result—but that where a number of trains, all deriving their motive power from one source, and each one receiving power in strict proportion to its load, are running, half in one direction and half in another, over the same grade, its influence upon the total work done is neutralized.

If the contrary is true with steam locomotives electric propulsion may score again in the competition, as Siemens says of it, in discussing the inter-action of prime and counter currents: "If two trains should be placed on the same pair of rails, the one moving upon an ascending portion, the other upon a descending portion of the same, power would be transmitted through the rails from the latter to the former, and the two might therefore be considered as connected by means of an invisible wire rope."

Your data as to the number of cars in the average train and the average number of passengers carried per train vary somewhat from those supplied to me, and seem to be more exact and to cover a longer period of observation. I will therefore substitute them in my calculation of average work; and since my comparison was between the average, as performed by steam locomotives, and the maximum that could by any chance be demanded of electro-motors, I will take the maximum train-load at 4 cars carrying 400 people 20 miles per hour—which is a remote possibility—and revise my estimate both of average and maximum work accordingly.

Your record of efficiency of the electric railway at Berlin differs materially from mine, wherein I find that the 5 horse-power steam engine driving the generating dynamo produced nearly 3 horse-power on the rails. Sir William Siemens in describing this road stated that "more than 50 per cent. of the power of the stationary engine is actually utilized," and Werner Siemens says: "It is perhaps merely a question of size and velocities of the driving and driven machines whether a still higher percentage of power may not be regained."

When it is considered that four years of experiment and improvement have elapsed since the building of this line the statement of Professor Lodge, viz., that the net power obtained at one end is necessarily (sic) rather less than 50 per cent. of the gross power applied at the other end—if the insulation is bad it may be very much less, becomes the more unintelligible. The only foundation for such an assertion that I can imagine might possibly be found in the experiments of the Siemens Brothers, which showed that the percentum of work reclaimed was at a maximum when the speed of the receiving was about ½ of that of the generating dynamo.

Your assumption, then, that only 25 per cent. of the original power can be reclaimed—or what is the same thing, that stationary steam engines of 50,000 horse-power are needed to produce 12,500 horse-power on the rails—seems to be without reasonable basis.

You have convicted me of one piece of carelessness, however, which is unpardonable, viz.: overlooking the fact that the 32 miles of elevated track in New York is double instead of single; and I accept your figure for the amount of central rail necessary—although it strikes me as excessive—and will amend my estimate accordingly.

In view of your doubt of its sufficient size, I am quite willing to substitute a 56-lb. for a 35-lb. rail, but not so much from electrical necessity as for the convenience and economy to which uniformity in the *matèriel* of an engineering structure conduces. For example, the interchangeability would permit of using worn-out line rails for conductors.

Some such consideration evidently led to the adoption of a 19-lb. rail at Port Rush, and the assumption that it was proportioned to the electrical requirements of that case is responsible for the erroneous conclusion you arrive at respecting the proper size of conductor for the case in question.

The elevated roads offer such exceptional facilities for insulating the conducting rail that any augmentation for loss of current would be farcical. I am confident that it could readily be kept within 1 per cent. in a distance of 20 miles.

Your figures for the efficiency of marine engines—viz., 1⅝ lbs. of coal per horse-power—may possibly be attained under special circumstances, but I venture to assert that in the conditions of actual practice the same engines would consume nearer 3 than 2 lbs. of coal per horse-power.

As for a locomotive developing a horse-power for 2.88 lbs., I imagine it will be as startling to the profession generally as it was to me, and give rise to much conjecture whether such a result was derived from a laboratory experiment or in actual service,

If such locomotives can be had my judgment is seriously impaired, and, moreover, the management of our elevated roads is placed in a dilemma, one of whose horns is utter imbecility, and the other criminal negligence. To ignore the existence of such machines convicts it of one or the other. It seems more reasonable to assume that it makes the best of rather difficult conditions.

Concerning your prognostication of the cost of attendance in a system of electric propulsion, all that can properly be said is that experiecne alone can decide the matter. It is not out of place, however, to submit that a system which readily lends itself to the maintenance of lights brilliant and penetrating enough to pierce any fog precludes the necessity of a special lookout on the motor; and also that the liability to accident of marine machinery affords no parallel for similar contigencies with stationary engines.

Recapitulating, the exceptions to the argument which I admit are, viz.:

That the maximum train should be increased from three to four cars, and its speed from 13.5 to 20 miles per hour.

Also that the average train be increased from 3 to 3.75 cars, each carrying 32 instead of 25 persons.

Also that the quantity of central rail be increased from 32 to 80 miles, and its weight from 35 to 56 lbs. per yard.

Correcting my first published results—both maximum and average—with reference to them. I find the total horse-power that could be possibly called for to be about 10,000; and that each locomotive exerts at an average 22 horse-power at a cost of 23 lbs of coal per horse-power per hour.

It is only just to say that the substitution of electro-motors of half the weight of steam locomotives would reduce the total work required of the stationary generators about 10 per cent.; although no advantage is taken of the fact in the comparison.

Another fact bearing upon it, which has come to my knowledge since the first communication was published, is that only 6 per cent. of the total equipment of the elevated railroads is ever idle, and therefore, that 213 locomotives may be considered as under steam continually.

Exception has been taken—and I think justly—to the cost of the power-station at the Battery; but if it be too small for that locality it is sure to be large enough for West 59th street, where it may just as well be established, so far as engineering requirements go, although its upper stories would not be so desirable for company offices as they would in the first-mentioned situation. Furthermore, the power-station at 129th street might be erected at 96th street on gronnd already owned.

The tabular statements revised in conformity with these exceptions will then read as follows:

COST OF MOTIVE POWER PER HOUR WITH STEAM LOCOMOTIVES.

Interest upon and depreciation of 227 locomotives @ $6,500, at the rate of 15 per cent. per anum	$25.26
Wages of attendants for 227 locomotives	47.30
Total coal @ $3 per ton for 213 locomotives, developing 22 h. p. each @ 23 lb. per h. p.	144.00
Total per hour	$216.56

COST OF ELECTRIC INSTALLATION EQUIVALENT TO PRESENT MOTIVE EQUIPMENT.

10 stationary steam engines, 2,000 h. p. each, with boilers, costing, inclusive of erection	$500,000
16 generating dynamos, each 1,250 h. p. capacity, inclusive of erection	506,000
1 station house at East 129th street, for the Second and Third avenue lines	20,000
1 ditto at Battery for the Sixth and Ninth avenue lines	30,000
227 electro-motors @ $3,000	681,000
80 miles of central rail, 56 lbs. per yard, laid	142,000
Total	$1,879,000

COST OF MOTIVE POWER PER HOUR WITH ELECTRIC INSTALLATION.

Interest upon, and depreciation of, installation at the rate of 10 per cent. per annum	$21.49
Total coal @ 2 lbs. per h. p. and $3 per ton	53.62
Labor at power stations, 2 chief and 4 assistant engineers @ $22 per diem, 74 strokers @ $148 per diem	7.08
Wages of one attendant per motor, 227 @ $3 per diem	28.38
Total per hour	$110.57

To snm up, the ratio between the cost of electric propulsion and steam locomotion is about as 1 to 1.96; or $1 will obtain as much work by the former as $1.96 will by the latter.

Did space permit I would cite some expressions of Sir William Siemens concerning the future of electric propulsion, which certainly foretell great things. His views enlarged greatly as his investigations continued, and you must have in mind some of his earlier opinions when you impute to him a doubt of its economical utilization. He believed this to be close at hand, if not already arrived.

Let me say, finally, that I would be judge rather than advocate in this case and am ready to entertain any exception that is taken with a fair showing of relevancy; but at present I am aware of none—nor do I suspect the existence of any—which would materially affect the stated result. The data of performance of the elevated roads came from official sources, and the quotations of expert opinion give the *thoughts* of the speaker at the time of utterance—not only his *words*—as faithfully as isolated sentences can.

In conclusion, I deprecate any intention of inaugurating a crusade against steam locomotives, and urge that my argument be considered strictly within the circumscribed limits to which it is confined, viz.: the applicability of electric propulsion to the elevated railroads of New York City.

THOMAS WHITESIDE RAE, C. E.

No. 115 Broadway, New York City, March 27, 1884.

The Massachusetts' Short-Haul Law.

TO THE EDITOR OF THE RAILROAD GAZETTE:

In your remarks on the "short-haul" law, in the *Gazette* of April 4, you apparently labor under a misapprehension of the meaning and intent of the law as construed in Massachusetts. Certainly your illustration of the "irrationality" of the law, in the case of the Delaware oystermen, does not apply to the law as understood by railroad men and the public in this state. For the freight in that case was not shipped "from the same original point of departure," nor does it appear that the Delaware oystermen paid a greater sum for the transportation of a like quantity than was paid by the Norfolk shippers. The Massachusetts law is simply this: that the Boston & Albany Railroad, for instance, shall not charge for transportation of the same class and quantity of freight from Albany to Springfield or Worcester a greater sum than it charges for transportation from Albany to Boston; and that the charge from Chicago to Worcester shall not be more than for a like shipment from Chicago to Boston. Or to take two connecting roads in Massachusetts: it does not mean that the Boston & Albany may not charge for a car-load from Boston to Framingham a greater sum than its share of a joint rate from Boston to Fitchburg *via* Framingham and the Old Colony road. So far as the law is concerned it may charge *as much* from Boston to Framingham as the joint-rate from Boston to Fitchburg.

The effect of the law has been that a car-load of grain or other merchandise from the West is delivered at points on the through lines in the interior of Massachusetts at Boston rates. And it is no hardship for a railroad to leave a car-load or a train at a point short of its terminus when it gets the price for hauling in through to the terminus. But, on the other hand, it was a hardship to the merchant or consumers in the interior town to be obliged to pay, in addition to the rate from the West to Boston, the local rate from Boston back to the interior town, as was the case before the law was passed. In a manufacturing state it is no unimportant factor in the prosperity of interior towns not to be placed at a disadvantage as compared with larger terminal points, and this has unquestionably promoted the success of manufacturing industries and the growth of villages, from which the railroads derive an increasing local traffic.

The recent discussion in Connecticut indicated that there was some misapprehension in regard to the "short-haul" law in force in Massachusetts. An examination of its terms will show that it does *not* mean that the charge shall be at the same rate per mile for the short haul as for the long, but that the sum paid shall not be any greater than for the long haul. And if a road (or two or more connecting roads) can afford to carry freight through to the terminus for a given price, it can afford to carry a like class and quantity of freight "from the same original point of departure" half the distance for the same price. If the New York, New Haven & Hartford and the New York & New England roads can carry freight from New York to Boston for 14 cents per hundred, the first named road can carry a like class and quantity from New York to Hartford for 14 cents. And the law of Massachusetts if applied to that line would mean that the New York & New Haven road might charge 14 cents from New York to Hartford, but should not charge 20 cents. This would be no injustice to the railroad, while it would relieve the intermediate point from the injustice of paying exorbitant rates to make up for the small profit of the through rates.

[It is true that the Massachusetts law would not apply to the case of the Delaware oystermen, because the terms of the law apply to shipments from the *same station* to different destinations, but not from different stations to the same destination; but the principle in the two cases is precisely the same, and we repeat that the prohibition is entirely irrational. The Delaware oystermen were charged, if we remember right, two or three times as much for shipments to Baltimore as was charged Norfolk oystermen for shipments over the same road to the same destination from points nearly twice as far distant, and the low rates to the Norfolk shippers alone made it possible to

carry the Delaware shipments without charging them still higher rates than they actually paid. The Massachusetts law is irrational because it forbids the carrying of a traffic which competition or other circumstances make it impossible to get except at a rate which yields a very small profit, unless the carrier will accept an insufficient profit also on other traffic not subject to the same competition. In the last case before the Massachusetts Commission, if the New York & New England had *advanced* its rate to the competing point, making it the same as to the local point, there would have been no violation of the law. This, to our mind, proves the irrationality of the law. If it had so happened that the loss by reducing the local rate would be greater than that by giving up the traffic at the competing point, doubtless the New York & New England would advance its rates instead of reducing them. Certainly the local stations would have gained nothing by that, but the railroad would have lost whatever profit it made on shipments to the competing point, and that place would have lost whatever advantage it secured from the New York & New England as a competing route. It is just the same with shipments of grain from Chicago or Albany to Boston or New York and intermediate points. It may be and frequently is perfectly just to charge more to the intermediate point; and we are very strongly inclined to believe that it will become almost necessary to make a lower rate on all grain brought to the seaboard for export than on that consumed at home—as, indeed, has been done on exports from Boston for many years, we believe—a palpable violation of the law it would seem.

"It is no hardship," says our correspondent, "for a railroad to leave a car-load or a train at a point short of its terminus when it gets the price for hauling it through to the terminus." We beg his pardon. It may be the greatest of hardships—may make the difference between success and failure. A railroad gets its living as most manufacturers and merchants get theirs, by doing work at all sorts of profits, some very small and some very large. It does not accept the small profits because it prefers them, but in almost every instance because it can't get any more. To say that it shall charge no more for a haul from Albany to Worcester than for one from Albany to Boston is exactly the same in nature as to prohibit a grocer from selling tea at a profit of 20 cents a pound because he sells sugar at a profit of ¼ cent a pound.

It of course does not follow that higher rates for the shorter haul are always justifiable. Each case must be judged by itself. What we urge is that it is impossible so make a general law which will work justly in all cases. Most of the Massachusetts through railroads now have such profits that the application of the law may do them little harm; and the competition of the most profitable roads is such that very likely the rule would be quite generally applied without any law. But there was a time when in Massachusetts the application of the law must have worked very serious injury. When the railroads depend very largely for their profits on the produce which they carry to interior New England towns they would rather give up carrying to Boston than to make their charges as low to the interior as the water competition makes necessary to the seaboard. On a very large number of railroads such differences in rates are a condition of their existence. They have in their early days gained their whole support, or nearly the whole of it, from a light local traffic carried at high rates. If through traffic, *or any other new traffic*, offered, they accepted it at any rates necessary to secure it that left the least margin of profit. Perhaps in a few years their profits were made up of what we may call the original traffic, one-fifth of the whole amount in quantity but yielding one half of the net earnings of the road; while what we may call the "developed" traffic, four times as great, yielded only the same profit, or one fourth as much profit for the same amount of traffic, being made possible only by the low rates. But the addition of profit by this low-rate traffic in nearly all cases has resulted in a reduction in the rates on the original traffic, and in very many cases in a very great reduction. Part of the interest on the capital invested is paid by the through and other new traffic, and in so far may relieve the traffic which pays the highest rates. The differences which it is necessary to make come in a thousand shapes—differences in classification and rates, and in not a few cases higher charges for a short distance than for a longer one. The difference in itself is not evidence of injustice. It is simply evidence of what every one takes for granted in other kinds of business—that it is possible to make a larger profit on some things than on others, and that the profit is not always in proportion to the cost.—EDITOR RAILROAD GAZETTE.]

A Problem in Location.

CHICAGO, Ill., April 10, 1884.

TO THE EDITOR OF THE RAILROAD GAZETTE:

I would like to submit the following problem for your engineering column:

Given two parallel lines 2,000 ft. apart, it is required to connect these lines by two curves of equal radius in opposite directions and having a tangent 500 ft. long between them. The length of this connection, measured on one of the parallel lines, is to be 5,000 ft. What would be the radius and the centre angle of the requisite curves? E. E. W.

[We give place to this problem with pleasure with the proviso that answers shall show, first, the exact solution as a *mathematical* problem; and secondly, the proper solution in practical working as an *engineering* problem. The distinction between the two is a very important one.—EDITOR RAILROAD GAZETTE.]

Rate of Breakage of Chilled Cast-Iron Car Wheels on the Pennsylvania Railroad.

TO THE EDITOR OF THE RAILROAD GAZETTE:

Several articles in the *Railroad Gazette* during last year, referring to certain returns for a single month from one or two railroads, and hence suggesting or assuming the possibility that from 4 to 5 per cent. of all the cast wheels in this country were broken annually, have led me to an examination of the subject in order to obtain fuller information. The percentage mentioned has recently been assumed by an English railway paper as conceded, and an article based on this statement is now *en route* through the press.

In July last some results obtained from the Pennsylvania Railroad Company's shop reports were published in the *Gazette*, since when I have revised the figures then given (having been led into error through the way in which the car record is printed in Poor's Manual), and have added those for 1883. The following table shows these results, covering all wheels removed for fracture of their lines east of Pittsburgh and Erie during the years stated:

Statement Showing Number of Wheels Cracked or Broken under Cars on Pennsylvania Railroad of all Makes and in all Branches of Service.

	Year.		
	1881.	1882.	1883.
Total No. of wheels on road Jan 1..	356,326	460,480	453,610
Number cracked	2,034	2,197	2,872
Number broken	454	380	507
Total	2,488	2,577	3,379
Per cent. cracked	0.57	0.48	0.63
Per cent. broken	0.13	0.08	0.11
Total	0.70	0.56	0.74

The percentage is calculated on the same basis as in the articles in the *Railroad Gazette* already mentioned. Whether this is strictly correct or not, it is so for the purpose of comparison, and it is plain that to obtain a rate of even 4 per cent. the number of wheels on the road must be reduced to about one-sixth of those given, which would be absurd.

It is almost equally evident that, assuming the wheels in question to be of average quality, representing, as they do, the product of 15 to 20 of the largest manufactories, this rate of breakage is not probably exceeded elsewhere. On roads subject to greater extremes of temperature the grades are less severe. For the Southern seaboard, the valley of the Mississippi and the Western plains it is reasonable to assume a lower rate.

It is difficult to see, therefore, how a 4 or 5 per cent. rate can be maintained.

As the figures given are for all branches of service, of course the great preponderance of freight cars brings down the *average* rate practically to that of this branch of the freight car wheels alone, I find in 1883: 2,774 cracked, being 0.6 of 1 per cent. of 434,104; 386 broken, being 0.09 of 1 per cent. of 434,104; and of the passenger cars and engines 98 cracked, being 0.5 of 1 per cent. of 19,506; 121 broken, being 0.6 of 1 per cent of 19,506.

In estimating the *capability* of an article, not the average but the maximum, if accessible, should be considered. It has, therefore, seemed desirable to obtain complete statistics of the wear and strength of cast wheels of a single reputable make, in each of the different branches of service of a single road, where the number used, and the character of the service, should be such as to make the results valuable. In the case which I have selected (perhaps the only one which can offer so extensive results with a single wheel), the railroad company is itself the wheel-maker; and however this may be thought to bias its judgement as to the character of its work, it is certain that it takes a great deal of trouble to ascertain this, and if not applied to its improvement, very unnecessary trouble, since the figures are not published. What I have prepared is a summary only of statements much more detailed.

I present, therefore, the following table made up from Pennsylvania Railroad Company's shop reports, giving reports as to all the *wheels of their own make* taken out from *engines and passenger cars* in 1883.

These wheels are all made at Altoona, where the company has cast, for the last twelve years, from 100 to 400 daily. During 1883 I believe their product was about 70,000 wheels. They are made of certain charcoal irons, certain anthracite irons, old wheels of their own make and steel; and are certainly not high-priced, since the company claim that they are cheaper at first cost, as well as better, than those of other makers. They are not presented here as the *best* cast wheels, but simply as those meeting the conditions already stated. Some makers and users of wheels contend that the best are made of charcoal iron alone, or in combination with a small amount of old wheels. If so, the *capability* of the cast wheel must be still greater than shown in this table.

Chilled Car-Wheels Manufactured by the Pennsylvania Railroad, Taken out in 1883.

KIND OF WHEEL AND SERVICE.	Cracked and broken.		No. worn on flange or tread.	No. "shelled," "comby," etc., in chill	No. with miscellaneous defects
	No.	Per cent. of all taken out.			
33 in. Pullman pass. cars	*9	1.1	64	72	1
33 in. Bag., exp. and post cars	14	0.6	289	502	15
33 in. Pass. comb. and emig. cars	63	0.8	596	586	58
30 in. Pass. cars	2	0.5	227	32	....
30 in. Freight engines	4	1.0	216	58	2
33 in. " "	52	1.3	1,127	528	93
33 in. Pass. "	34	1.8	337	858	19
26 in. Freight "	4	1.0	242	30	32
26 in. Pass. "	2	2.0	66	18	13
28 in. Freight "	29	2.8	780	79	12
30 in. Pass. "	6	0.9	342	199	6
28 in. " "	11	2.5	232	93	1
Total	230	1.1	4,418	3,055	252

KIND OF WHEEL AND SERVICE.	Total taken out as defective.		Taken out for "flat-sliding."		Taken out—good for refitting	Total taken out
	No.	Av. mileage	No.	Per cent. of all taken out		
33 in. Pullman pass cars.	146	69,956	468	60	170	784
33 in. Bag., exp. and post cars	820	64,077	1,192	48	472	2,484
33 in Pass. comb and emig. cars	1,303	52,114	4,466	57	2,029	7,798
30 in. Pass. cars	161	50,857	123	34	79	363
30 in. Freight engines	280	49,212	46	12	64	390
33 in. " "	1,800	43,900	1,488	38	676	3,964
33 in. Pass. "	1,218	42,664	340	18	298	1,886
26 in. Freight "	308	41,620	....	....	56	364
26 in. Pass. "	99	38,267	....	....	19	118
28 in. Freight "	900	37,895	....	....	124	1,024
30 in. Pass. "	553	36,046	18	2.5	121	692
28 in. " "	337	35,586	....	....	102	439
Total	7,955		8,141	40	4,210	20,306

* 8 hub cracked, 1 broken.

It will be noticed:

1. That the chief exception to the regular decrease of mileage with the size of the wheel is in the 30-in. passenger engine wheels. These suffer both in truck and tender service and at passenger train speed, while the others are used under one only or at lower speed. The high mileage of the first line may be connected with the infrequent stops of the Pullman cars.

2. The breakage rate of the wheels less than 30 in. in diameter is higher than that of any others. These wheels are used under engine trucks only.

3. The proportion of *broken* wheels (which are the dangerous ones) is 0.6 of 1 per cent. (see other table), and the broken and cracked together are 1.1 per cent. These average rates are chiefly due to the higher rate among the small engine wheels, the larger car wheels showing much less than 1 per cent. broken and cracked, and no doubt *less than* 0.6 *of* 1 *per cent. broken only.*

4. The wheels removed as defective, after giving the mileage stated, form but about 39 per cent. of all removed. Of the balance 21 per cent. were good for refitting and 40 per cent. ("flat sliding") have been spoiled by the brake. It is well known, also, that many wheels are fractured and many injured on the tread from this cause, so that it would appear that the chief cause of low mileage in chilled wheels is one that would act with still greater force upon any softer metal. In other words, in an economical point of view the question is not so much one of *breakage* as of *braking*, or the art of applying brakes in such way as not to prematurely shorten the life of the wheel.

Master Car-Builders' Association—Committee Circulars.

The following circulars of inquiry from the committees of the Master Car-Builders' Association have been issued by the Secretary:

AUTOMATIC FREIGHT-CAR BRAKES.

The undersigned, your Committee on the above subject, respectfully solicit replies to the following questions:

1. Do you consider it necessary that freight cars be fitted with automatic brakes?

2. Have you had any experience with automatic brakes suitable for freight cars? If so, please give the name of the brakes.

3. What failures are peculiar to each of the systems you have had experience with?

4. Are these failures capable of being overcome, or are they insurmountable, and consequently sufficient to condemn the brake?

5. What is the maximum sum you would feel warranted in expending per car in the application of an automatic brake?

H. C. MCCARTY,
CHARLES BLACKWELL,
C. H. BURCHARD,
} Committee.

Answers to this circular should be addressed to R. C. McCarty, Chairman of Committee, Philadelphia & Erie Division Pennsylvania Railroad, Williamsport, Pa.

PLANS FOR CAR-SHOPS AND THE ARRANGEMENT OF CAR-SHOP MACHINERY.

The undersigned, your Committee on the above subject, respectfully solicit replies to the following questions:

1. What description of building do you consider most convenient for the erection and repairs of passenger and freight cars?

2. Have you seen, or had any experience with, circular erecting shops with turn-table? If so, how do they com-

pare with rectangular buildings with transfer-table in first cost of building and in economical execution of car-building and repairs?

3. How many cars do you consider advisable to erect or repair on one track? and what length of track would you require for each car?

4. What is the minimum distance you would have between centres of tracks in rectangular buildings? In case of circular shop, give this distance on inner wall or circle.

5. In tracks used for the repairs of cars do you recommend pits? If so, what length, and also depth below rail, should they be?

6. What material do you prefer for flooring of car-shop? If plank, should it run parallel with or at right angles to tracks?

7. Do you recommend a roof of clear span from wall to wall, or one supported by one or more intermediate posts? If the latter, how do you recommend their being spaced?

8. Of what material should roof be constructed, both truss and covering?

9. What height should be given between top of rail and bottom of truss?

10. Do you consider skylights essential? If so, in what form should they be applied? Should they have vertical sashes in clear-story, or sashes at same angle as, and laid directly on, main roof?

11. Give dimensions and style of door for erecting shop (with or without sash), and which way to open.

12. How should shops be heated?

26. Give plans showing location and size of tools, machines, etc., in smith, machine, cabinet, and other shops.

CHARLES BLACKWELL,
H. C. MCCARTY,
E. MINSHULL, } Committee.

Answers to the above circular should be sent to Mr. Charles Blackwell, Chairman of Committee, Norfolk & Western Railroad, Roanoke, Va., and, owing to the shortness of the time before the next annual convention will be held, answers should be sent as promptly as possible.

Transportation in Congress.

In the Senate on the 10th:

Mr. Bowen (Colorado) introduced a bill to provide for the protection of employés of railroad corporations. Referred.

It provides that railway companies be compelled after Sept. 1, 1884, to have all new freight cars, purchased or built, so equipped as to admit of their being coupled without it being necessary for the employé to go between them for that purpose, and in making repairs on the old cars to furnish them with similar equipments; also, when any such employé may sustain personal or disabling injury by reason of having to go between two freight cars for the purpose of coupling or uncoupling the same, where both or either one of the said cars are in use, the company using such a car or cars shall forfeit to the employé or to his heirs, if he should die from such injury, $500 as a penalty. This penalty is to be no bar to recovery of any damages for such an injury which a competent court may award. It provides, further, that any contract entered into by the injured employé prior to incurring the injury by which he may agree to waive his right to recover damages for such injury shall be null and void.

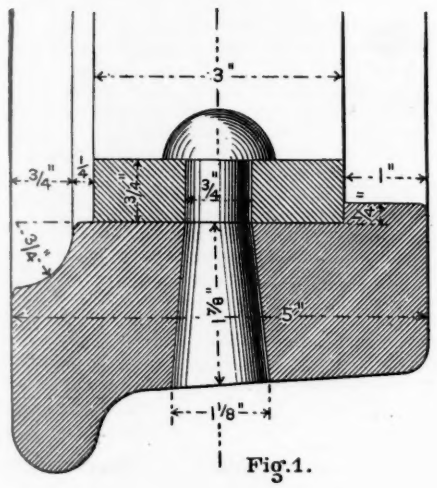


Fig. 1.

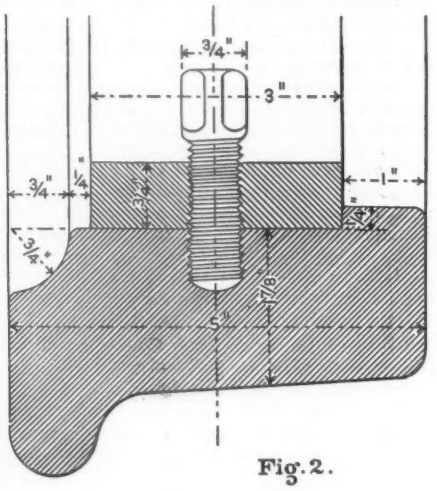


Fig. 2.

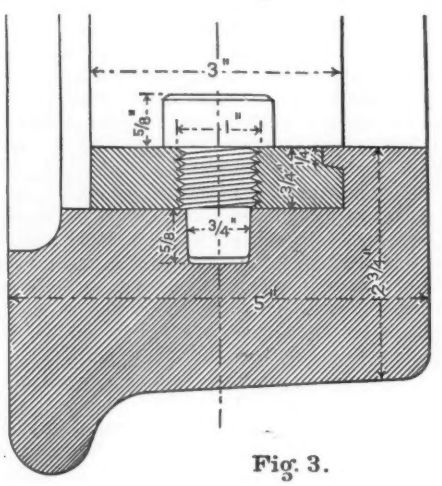


Fig. 3.

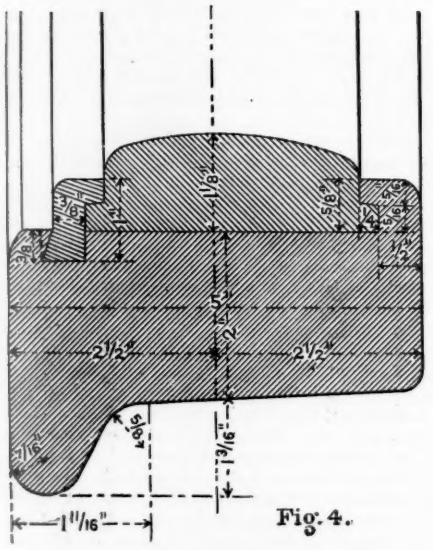


Fig. 4.

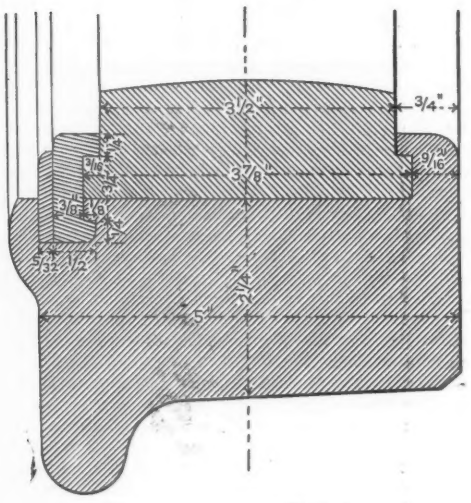


Fig. 5.

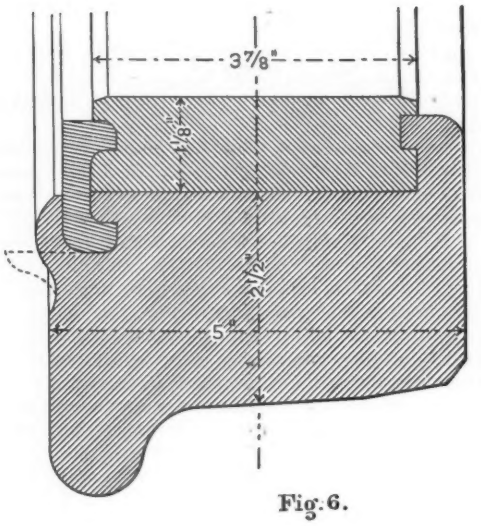


Fig. 6.

ENGLISH RAILWAY WHEELS.

13. Give diameter of turn-table or length of transfer-table, according to which you prefer, and the most economical mode of operating same.

14. For what percentage of passenger and freight cars passing over your road should shop accommodations be provided for building and repairing?

15. Give leading dimensions and particulars of what you consider the best existing shop for car-building or repairing with cost of same per stall or track (giving length of stall). Give, if possible, a plan of general arrangement of shops, with relative positions and sizes of different buildings.

16. For the annual output of, say, 12 passenger coaches and 2,400 freight cars, what size building do you recommend for containing the wood working machinery?

17. What machines would be necessary for economically preparing the lumber for the above work?

18. What power is required to run this machinery, and at what speed do you recommend line shaft to be run?

19. Do you recommend shafting being suspended from roof, as usually practiced, or placed in cellar provided for the purpose?

20. Do you know of any means of removing shavings, chips, etc., from machines to the boiler-room superior to the exhaust-fan and tubing? If so, describe same.

21. What are the minimum dimensions of a shaving-tower necessary for a mill of above capacity?

22. What is best mode of heating and lighting mill?

23. Please give dimensions and particulars of what you consider the best existing planing mill for approximately above capacity, with plan showing position and name of the various machines, direction from which rough material is received and finished stuff turned out.

24. What make and size dry-kiln do you recommend for output of cars mentioned?

25. Have you any plan to suggest for ventilating smith-shop, to remove gas and smoke?

English Railway Wheels.

As we think a description of the principal varieties of wheels used on railroads in England and her colonies may be found interesting and timely, we propose to describe those in most general use and explain the methods adopted in their manufacture.

A few wheels running in England are made, like our chilled wheel, in one solid casting, generally of steel, but with this exception all wheels, whether for engines or tenders, passenger or freight cars, have weldless tires. The best brands of Yorkshire iron, "Low Moor," "Taylor Bros." or "Farnley," were formerly used for this purpose, but steel is not only cheaper but far more durable, and therefore Bessemer or Siemens-Martin tires are largely used under cars, and to some extent under engines and tenders. Crucible steel, as it is called, some of it being made by the Siemens-Martin process, is generally used for locomotive tires, as being harder, stronger and more durable than the steel sold as "Bessemer." Some locomotive superintendents consider that the quality of the steel is more influenced by the purity of the ores used, and the care taken in manufacture, than by the process used to produce the steel, as good Bessemer tires are often found to wear better than some stamped "Crucible."

The tires are secured to the wheels in various ways, the oldest plan, still largely used on the enormous number of coal cars belonging to private owners, is by conical or tapered rivets, as shown in fig. 1. These rivets are usually made with a cup head like an ordinary rivet, and riveted up on the outside, but the better plan is to make taper rivets to the exact section of the hole, and rivet them up on the inside, either by hand, or by a riveting machine. Sometimes taper bolts are used instead of rivets, the end of the bolts being slightly riveted over their nuts, to prevent them coming off. It is evident, however, that this plan of fastening by rivets or bolts must weaken the tire considerably, by cutting out such a large hole in the section, though, strange to say, these tires break more frequently in the solid than across the hole. The tire also has a tendency to wear in flat places at the holes; consequently many engineers prefer to fasten them by means of studs or set screws, (See fig. 2), which are tapped both into the rim of wheel and the tire or sometimes into the tire only. This plan is quite sufficient to keep the tires tight, especially as they are shrunk on the wheel hot. Should, however, the tire break from any cause, the studs or rivets occasionally prove insufficient to hold the tire in place, and it flies off with disastrous results. To obviate this danger several kinds of continuous fastenings have been devised, a very good plan being that recommended by the London & Northwestern Railway Co. (see fig. 3), in which both the tire and wheel are grooved to fit one another, and are retained in place by set-screws. This method is still largely used on locomotives. Several methods have also been patented with the same object, most of them being some kind of continuous clipping ring which dovetails into the tire, so that should the tire break it is still held in its place by the rings. By far the most successful of these patents is that of Mr. R. C. Mansel, formerly Carriage Superintendent of the Southeastern Railway. This arrangement is shown in fig. 7 as applied to his patent wood wheel for passenger cars, but it is also applicable to spoke wheels. It consists of two clipping rings, placed one on each side of the wheel, each ring having a rib or projection formed on it which fits into a corresponding recess in the tire. The two rings are bolted together as shown. These fastenings have been remarkably successful, and by far the larger number of passenger-car wheels in Great Britain are on this plan.

Gibson's fastening, fig. 4, is by a dovetail ring on one side of the ring and a recess in the tire on the other. To get the ring into the tire the latter is grooved as wide as the widest part of the ring, and is afterward hammered so as to close on the ring. Beattie's patent, which has been superseded by cheaper and better contrivances, is somewhat similar, but

instead of a continuous ring short clips are used between each spoke.

Carlton & Stroudley's patent, fig. 5, is a cheap and efficient fastening which is largely used. A sectional ring is sprung into a recess in the tire and is kept in place by a taper key ring, which in its turn is secured by slightly hammering down the tire while warm. A side recess keeps the other side from moving The rings are placed so that the key ring covers the joint of the retaining ring.

Drummond's patent, fig. 6, consists of one retaining ring which fits into grooves made in the tire and wheel. After the ring is in its place the tire, which is rolled to the dotted lines, is forced down over the ring and keeps it in position. This is a good fastening, but requires more hand work than Carlton & Stroudley's, both in placing a new tire on the wheel and in removing an old tire. There are several other plans in use, but as they bear a close resemblance to those we have noticed it is unnecessary to mention them.

(TO BE CONTINUED.)

The General Time Convention.

The General Time Convention met in Cincinnati at 11 a. m. on Wednesday, April 9, as briefly noted last week. There were present 59 gentlemen representing 35 different lines.

Mr. P. P. Wright was unanimously re-elected chairman, and Mr. W. F. Allen, Secretary.

On motion, D. W. C. Rowland, late General Superintendent of the Louisville & Nashville was invited to take a seat in the Convention.

The CHAIRMAN announced that the next business in order was the consideration of the time schedule.

Mr. J. M. TOUCEY offered the following resolution, which was adopted:

"Resolved, That the present schedule for through trains be continued in force for the coming season, and that where local changes are made they shall take effect on Sunday, May 11, 1884."

The CHAIRMAN: The members of this Convention have every reason to congratulate themselves upon the success of the movement by which the adoption of Standard Time was secured. In order that a record of the history of the movement may be placed up our minutes, our Secretary has prepared a final report on the subject, which will now be read.

The Secretary then read the following:

REPORT ON THE ADOPTION OF STANDARD TIME.

The system of Standard Time which this Convention indorsed at its meeting held in St. Louis in April, 1883, being now in force, it appears fitting that some record of its adoption should be placed upon your minutes.

Primarily this movement may be traced to a paper on the subject submitted by the American Metrological Society at your meeting of Oct. 13, 1881. In this paper a single standard for the whole country was proposed, and the hour theory suggested as an alternative proposition. A suggestion of General Hazen respecting time balls is one that should be carried into effect. At the time this paper was submitted there appeared to be little hope of any reform being soon accomplished.

A brief reference may be made to the earlier history of this subject. Sir John Herschel first mentioned the general idea in 1828; the late Prof. Benjamin Pierce first proposed the theory of standard time based upon the 75th and 90th, etc,, Greenwich meridians in 1873 or 1874. Previously, in 1869, Prof. C. F. Dowd had proposed the hour difference theory based upon Washington time; in 1870 the *Railroad Gazette* urged the adoption of a uniform standard; in January, 1874, your Secretary suggested the theory of reform as a result of a study of the situation as it then presented itself; in 1875, Mr. Sandford Fleming proposed the hour difference theory for the use of the whole world; in 1881. Dr. Thomas Hill, of Portland, Me., formerly President of Harvard College, proposed a similar theory. So far as I have been able to ascertain, all of these different persons reached their conclusions and formulated their theories independently of each other. In 1879 Prof. Cleveland Abbe and Mr. E. B. Elliott made an admirable report on the subject to the American Metrological Society (in which report they alluded to a previous report made in 1875), and followed this in 1881 by submitting to this Convention the paper before referred to. The subject was also discussed in various papers by Dr. F. A. P. Barnard, President of the American Metrological Society, and by members of the American Society of Civil Engineers and the Society for the Advancement of Science. In 1882 E. R. Knorr, C. E., issued an elaborated pamphlet suggesting the joint use of local and Greenwich time. In the pamphlet containing the proceedings of the American Metrological Society for 1879 the names of 25 persons other than those here named are mentioned as having published articles relative to Standard Time. In addition to those named I believe almost every city in the country has recently discovered that within its borders dwelt "the Father of Standard Time." Scientists do not generally patent their theories. Had all applied for patents it appears probable that we should have had another car-coupler muddle.

A number of systems were proposed, based upon this hour theory. Prof. Dowd suggested at different times three systems, based respectively upon Washington, New York city and Greenwich 75th meridian time, etc., to various railroad associations and by circulars, and spent much time laboriously calculating the mean time of all railway stations. Sandford Fleming contributed many valuable papers on the subject, and in 1882, in connection with the American Society of Civil Engineers, he forwarded circulars to a number of railway officials and other prominent persons, in which he proposed a system based upon the hour difference theory. Edwin Hill, of New Haven, in 1882, also proposed a system, Col. H. S. Haines proposed a system for the southern railways in 1883. It may be said of these propositions that no work of this character is entirely lost, and full honor should be done to their authors. With the exception of Col. Haines they proposed boundary lines and governing meridians, to which you were expected to adapt yourselves. The system proposed to you in April, 1883, suggested divisions and meridians which were best adapted for *your* operations, but which other interests could readily adapt themselves to without inconvenience. Whether this fact was the reason that induced you to give the system your practical endorsement you are yourselves the best judges.

You are aware that no session of the Convention was held in April, 1882, which would have been the first meeting after the one in which the communication of the American Metrological Society was presented, and that only 16 persons were present at the next meeting in Cleveland, in October, 1882, when, however, the subject of Standard Time was informally discussed.

The published proceedings of your last two meetings furnish a sufficient history of the successful movement prior to and including Oct. 11, 1883, the resolutions pledging yourselves to put the new standards in effect on Nov. 18, 1883, having been then adopted. One week later the Southern Railway Time Convention in New York unanimously adopted the same resolution.

Previous to this the Central Vermont; the Concord; Northern (N. H.); Boston, Concord & Montreal; Passumpsic, and Southeastern railroads had adopted the time of the 75th meridian, and commenced to run their trains by that time on Oct. 7, 1883, the Ogdensburg & Lake Champlain Railroad following on Oct. 15.

The desirability of having the time of New York city, as the most important city on the continent, conform to the new standard did not admit of a question. On Oct. 19 the second day after the meeting of the Southern Railway Time Convention, in company with Mr. James Hamblet, who has charge of the New York time service of the Western Union Telegraph Co., and who was an enthusiastic advocate of Standard Time, your Secretary called upon Mayor Edson, who received the subject favorably. Subsequently Mayor Edson forwarded a letter, written at his request, proposing the change to the Board of Aldermen, with a commendatory message. At this time Prof. J. K. Rees, Secretary of the American Metrological Society and adjunct Professor of Astronomy at Columbia College, took charge of this matter in New York city, and to his good judgment, knowledge of men, and wise management, the prompt adoption of the new standard in New York city is due.

Of the 100 principal cities of the United States named in the census of 1880, 70 immediately, and 8 more subsequently, followed the example of the metropolis.

Your thanks are especially due to Prof. J. K. Rees, of New York city, also to Mr. J. Raynor Edmands, of Boston (and I cannot speak too highly of the work of these gentlemen), for the hearty, energetic and successful aid which they gave the movement.

The co-operatien of scientific men generally was a marked feature of this period, and among them I wish especially to refer to Dr. F. A. P. Barnard, Rear-Admiral R. W. Shufeldt, Prof. Leonard Waldo, Prof. Cleveland Abbe, and Prof. Pickering, whose work came within my personal knowledge. There were doubtless many others who may be known to you. The hearty and very valuable support given the movement by the railroad newspapers and the press of the country generally, is worthy of special notice.

Of the various circulars issued on behalf of the Convention between Oct. 11 and Nov. 18, and of the numerous letters, telegrams and inquiries of all characters for details, etc., which were exchanged, it is unnecessary here to speak. The situation was rendered more difficult from the fact that in the minds of many persons Standard Time was confounded with the 24-hour system.

The Union Division of the Union Pacific, the Central Pacific and Southern Pacific west of Deming have not yet adopted Standard Time, but I am assured that with the spring change of schedule the Union Pacific will make the change, and understand, also, that the Central and Southern Pacific roads are likely to follow. The Southern Pacific east of Deming now uses Central Standard Time.

On Nov. 18, 1883, outside of the roads above named and their branches 90 per cent. of all the railroads in the country adopted Standard Time, and within a very few weeks the other 10 per cent. fell into line. Every road in Canada almost immediately conformed, and all are running by Eastern time.

From a careful study of the whole situation, as developed by the responses to the circulars recently sent you, I am convinced that, at the present date, not over 5,000,000, counting men, women and children, out of the 50,000,000 of people in the United States, are using local time. All parts of the Dominion of Canada, except the city of St. John, N. B., use Standard Time, Halifax using that of the 60th meridian. The population of the Dominion is about 5,000,000.

By an act of Congress, approved March 14, 1884, the time of the 75th meridian was made the legal standard for the District of Columbia and the city of Washington.

On Nov. 18, 1883, the ball on the tower of the Western Union building, in New York city, dropped for the first occasion in its history on Sunday. Standing upon the roof of that building, about 100 ft. from the tower, in the midst of a little group of interested spectators, I heard the bells of St. Paul's Chapel strike on the old time. Four minutes later, obedient to the electric signal from the Naval Observatory at Washington, 240 miles away, the time-ball made its rapid descent, the chimes of old Trinity rang 12 measured strokes, and local time was abandoned, probably forever.

The relief experienced at this moment in realizing that the task you had assigned me had been fully consummated you may understand, but I cannot find words to express. It was your hearty and earnest co-operation that had made this consummation possible. It is a conclusive evidence of the value of the influence of this and your associate convention that the system of time adopted by you now governs the daily and hourly actions of at least 50,000,000 people.

Respectfully submitted, W. F. ALLEN.

Mr. C. E. PUGH: The report of the Secretary has given us a concise and very interesting history of this Standard Time movement. I move that it be accepted and printed in full with the proceedings, and that the additional thanks of the Convention be tendered Mr. Allen for the compilation of this valuable report.

This motion was seconded and unanimously adopted.

The CHAIRMAN: I have just received a request from Prof. C. F. Dowd, asking that the Convention give him five minutes to deliver an address on the subject of the 24-hour method of reckoning time. What is the pleasure of the Convention?

After remarks by Messrs. Toucey, Thomas and others, it was decided, by a unanimous vote, to respectfully decline Mr. Dowd's request, and the Chairman was requested to so notify him.

TRAIN SIGNALS.

The CHAIRMAN then called for the report on Uniform Train Signals, the Committee consisting of Messrs. McCrea, Thomas, Talmage, Parker and Merrill.

Mr. MCCREA, Chairman of the Committee, called attention to the report on the vote which has been distributed among the members of the Convention (the original report was published in our numbers for Nov. 2 and Dec. 7, 1883, pages 717 and 803) and presented the following supplementary report:

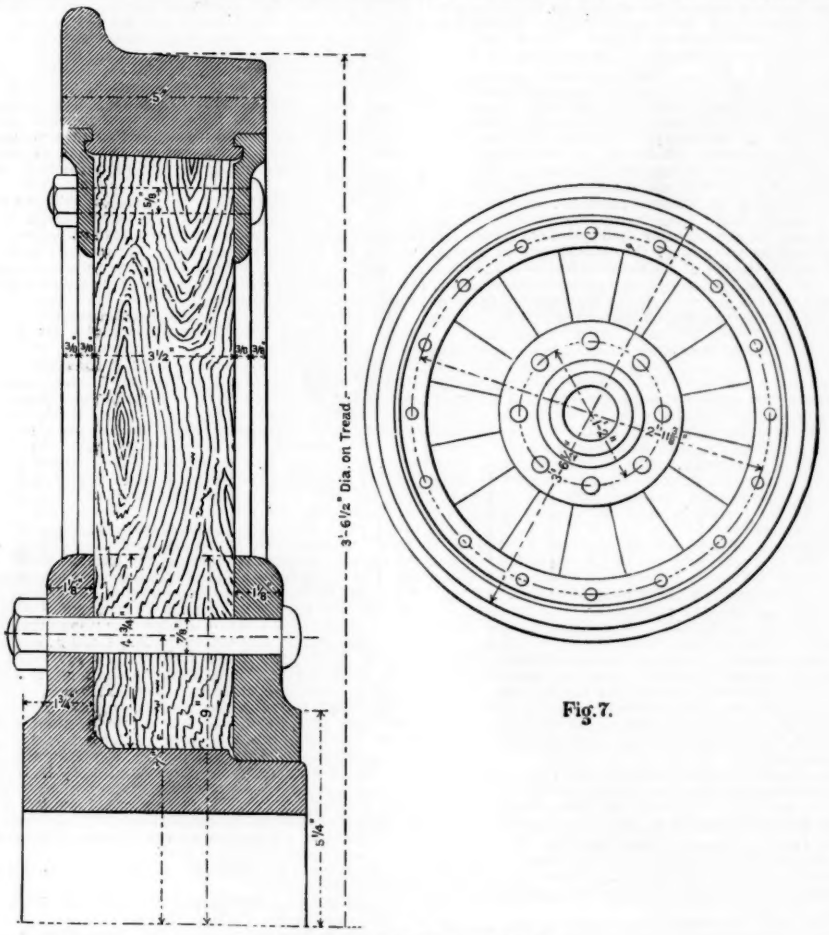


Fig. 7.

ENGLISH RAILWAY WHEELS.

SUPPLEMENTARY REPORT ON UNIFORM TRAIN SIGNALS.

Mr. Chairman and Gentlemen of the Convention:

In accordance with the resolution offered at the Chicago Convention on Oct. 11, 1883, the report of the Committee on Uniform Signals has been printed and submitted to the various railroads of the United States.

The results and criticisms have been arranged in the shape of a general pamphlet, which has to-day been distributed among the members of the Convention.

The Committee's report goes quite fully into the reasons for making their various recommendations, but a little explanation may clear away some of the objections that have been raised.

It has been asserted by many that the bell-cord and whistle signals are too voluminous. While this criticism may be fair it must be remembered that the Committee had to be guided somewhat by the laws of "supply and demand"; and an examination of the statistics submitted with the report will show that many signals in common use were left out. [In the case of whistle signals they were reduced from 26 to 13.]

Such being the facts it was not the understanding of the Committee that it would be incumbent upon each road to adopt all of the signals in these classes, but that when a signal was used it should be given in the manner recommended. To illustrate, if on any road it is deemed inadvisable to use the signal indicating to the flagman that he must go back, the five blasts of the whistle recommended for such signal might be omitted from their code; again, upon many roads it will not be considered desirable to carry a signal indicating "a train following which is irregular," and in this case it may also be omitted.

Many objections have been raised to the green and white signals recommended by the Committee to indicate "a train following which is irregular," the principal being, that in day-time, when the flags were in a drooping position, and the white somewhat soiled, they would be mistaken for green; and that at night-time the green and white lantern would, in consequence of the colors running together, show white. This objection can be overcome by using, in day-time, tin disks in the shape of the flags, and painted one-half green and one-half white; while, at night-time, four lamps can be used, two green and two white, and placed on the engine at a sufficient distance apart to prevent the colors from running together.

The Committee found great difficulty in providing for this signal, for the reason that the range of color signals is extremely limited; therefore, in assigning colors, the most complicated and least desirable was given to the one that would probably be least used in actual practice.

The great difference of opinion that seems to exist, as shown by the communications received by the Committee, appears to be in regard to the hand and lamp motions, many thinking that the "go-ahead" and "back-up" should be reversed. The reasons for adopting those recommended by the Committee are given very fully in their report, but they were guided by one consideration not given (because it would have appeared more like an argument than a reason), namely, that the "up and down" movement is more likely to extinguish the lamp than any other, and, as the engineer is always at the "go-ahead" end of his train, he is in a better position to see and stop, should anything be wrong, than when he is backing; whereas, if the light should go out in giving the "up and down" signal to "back-up," there is less likelihood of his being in a position to see that he should stop even without receiving a signal.

Objection has been raised to the use of the green signal for caution, some advocating its use as a safety signal, while others think that it should indicate "train orders," for the reason that there is danger of the white light becoming confused with others of the same color used for illuminating purposes and not connected with signals. This argument is a good one, but there are only three colors which are of any practicable value in giving signals, namely: "red, green and white;" and in the gradual development of traffic on a road there always comes a time when, in order to get the best results without the investment of a large additional amount of capital, a "cautionary" or green signal has to be introduced and, to observe this strictly, it is necessary for the train to be slowed and gotten under control, or have it understood that "green" (should it also be used for safety) has different meanings in different positions, and thus run the risk of a mistake being made in the interpretation of the signal displayed. Of course, after the business of a road has reached a point that will justify the expenditure of capital sufficient to enable the use of the absolute block—*i. e.*, either "stop" or "all clear," green can be used to indicate safety, but even then there is no very strong argument in favor of it, provided it is fully understood that "red" under all circumstances means "stop," and must not be disregarded.

Some correspondents have stated that they are unwilling to make a change from the systems now in use, fearing that any radical move would result in accidents. Of course this is a matter that each must decide for himself; but at least three members of the Committee have, within their own recent experience, been obliged to make fully as radical changes as those proposed, both in signals and rules, covering large territory and long lines of road, and they have found, without an exception, that not the slightest trouble resulted, it only having been necessary to see that their men were carefully instructed in and fully understood the details of the change.

As an indication of how the general public view this movement it is only necessary to call the attention of the Convention to the fact that a bill has been presented in Congress by Mr. Calkins, a prominent member from Indiana, making it obligatory upon all roads to adopt a uniform set of signals as set forth in the bill. In addition to this there are bills now pending, or about to be offered, in the legislatures of several states regulating this same matter, and it certainly seems to us much better that the railroads should, for themselves, adopt a code that would be uniform, rather than be subjected to the confusion and chance for disaster (to say nothing of the expense) that would result should it become necessary to change the signals every time that a train crosses a state line.

With these remarks the Committee submit their report for such action as the Convention may think proper.

J. MCCREA, Chairman.

Mr. W. W. PEABODY offered the following resolution:

"*Resolved*, That the report of the Committee be received and its recommendations adopted, and that where changes in the signals are necessary in order to conform to the new code the changes shall go into effect on the same date as the spring change of time."

Mr. E. B. THOMAS: The Committee would be very glad to have a full and free expression of opinion as to the merits of the system recommended. If all roads refuse to adopt the signals simply because they are those of another road it will be impossible to secure uniformity. Concessions must necessarily be made on the part of each. We shall be glad to have the gentlemen present express themselves freely, and would like to have the sense of the convention on the report.

Mr. W. W. PEABODY: I hope there will be a full expression of opinion from those present. There is undoubtedly considerable difference of opinion as to the fixed signals recommended. There is one point in the report that I do not like. I refer to abandoning red signals as an indication of a train following. I should like to hear some remarks on this subject from the officers of roads upon which very many trains are run. It does not, perhaps, make as much difference where a road is double-tracked, but upon single-track roads I prefer red to the signal recommended by the Committee.

Mr. MCCREA: It was as difficult as it was desirable for the Committee to make their report a short one, and no extended argument was possible, each reason being given as concisely as possible. The object in recommending the green signal was for the purpose of making the red signal as absolutely as possible a danger signal only. By the system proposed red is used for danger only in all cases, and means absolutely *stop*. If an engineer out on the road with a train approaches another train on a side track, when he sees two red signals carried on the front of the other train, he should not be obliged to say to himself, "I will not stop in response to that red signal." This reason applies fully as much on a single-track road as on a double-track road. It should not be a question for the engineer to argue in his mind as to the classification of a red signal, but it should mean for him to stop, and he should have no grounds to question this at all. This also holds good in regard to the markers in the rear. Under the system recommended by the Committee square lamps would be used, with three sides green and the fourth side red. While the train is on the main track the side of the lamp which is red will show to the rear. When on the siding, by simply turning the red side in, the green shows back. The engineer of a passenger train following and expecting to pass a freight train on a siding, when he sees these two green lights it is clear evidence to him that the train he is to pass is on the siding. These were the reasons which governed the Committee in recommending them. I think myself that they are fully as valuable as any other suggestions in the report.

Mr. WRIGHT here asked Mr. ROBERT BLEE to take the chair, and spoke as follows:

Gentlemen, before this vote is finally taken I wish to make a statement. I do not desire to go into a discussion of the signals, but wish to place the position of the Lake Shore road properly before you. If this vote is taken and the resolution passed by a majority (and that majority might be a very respectable one) it may place our road in a very awkward position in respect to being bound by your decision. The roads composing the majority might not any of them be our connections, and these connecting roads might not make the change, in which case we would be placed in a worse position than we are at present. Under these circumstances we would not like to be considered as being bound to adopt these signals whether our connections do or not. I do not want to go into a discussion. There are some few things I would prefer to have different, but perhaps that is owing to my railroad education. All roads must make concessions. We are willing upon our part to do so. I would not like to say I would do so unless it was general, for, as I have stated, it might leave us in a worse condition than before. We cannot expect that all roads will go to one and adopt its code; some of us would be very glad if that were the case. We must make concessions and compromises. The object to be attained is very important and very desirable. In fact, the time has come when it should be understood that if we do not take the matter up ourselves the legislatures are very likely to take it up for us. You could hardly expect any committee to have done better than the Committee who have made this report, much labor and pains having been taken to communicate with the different roads who are using the various signals. If this vote is taken as to adopting these signals I should feel that the Lake Shore would have to vote in the negative. Nothwithstanding all that, if the vote should be otherwise unanimous and should result in our connections adopting these signals, so that we would not have any friction with said connections, we will gladly adopt them also. I simply want to make this explanation, so that if this vote should result in the adoption of these signals as recommended by the Committee, to take effect on the same date as the fall change of time, and we should find ourselves in such a position that we could not conform to them, we should not be accused of not living up in good faith to what was expected of us.

Mr. W. C. QUINCY: I move that the rules, as presented by the Committee, be taken up in the order under the several headings in which they were presented. If these signals are taken up separately, under their proper heads, we may all agree to one class of them and reject others. If the Committee's report be presented as a whole I should be compelled to vote against it.

Mr. Peabody's motion was then withdrawn.

Mr. MCCREA: This Convention could not adopt these rules and make them binding on the roads. The board of directors of each road must do that. The number of roads that are actually represented here are a very small proportion of the total roads in the United States. Out of the 196 roads voting, representing 58,000 miles, which is about 50 per cent. total mileage of the railroads in the United States, 158 roads, representing 50,000 miles, very nearly 50 per cent. of the total mileage of the United States, and 86 per cent. of the mileage of the roads that have voted on the subject, say they will adopt the system recommended. I was in hopes that the question would be very fully discussed here. It is discussion that is needed more than voting. If the Convention could pass a resolution, being guided by the vote as shown in the pamphlet, that they recommend that the system should be adopted by all the roads, and that they will adopt it on the date named by Mr. Peabody, the fact that we have agreed to adopt it will not secure its adoption by the other roads at all. I hope you understand how the public feel about this matter. Mr. Calkins, a prominent member of Congress from Indiana, has presented to Congress a bill making it obligatory for the roads in the United States to establish a uniform system of signals. I have not a copy of this bill with me, but have written Mr. Calkins a letter, and afterward sent him a copy of the Committee's report, and asked him if he would defer action for a while. In consequence of this the matter was not pushed, but I think it is very easy to understand that it is bound to come.

Mr. W. C. QUINCY: My motion was intended to get an expression of opinion in detail, but as it has not had that effect I ask the permission of the Chairman and Convention to withdraw it.

On motion of Mr. MCCREA Mr. QUINCY was allowed to withdraw his motion.

The following resolution was offered by Mr. J. M. TOUCEY and seconded by Mr. C. E. PUGH:

"*Resolved*, That the report of the Committee on Uniform Train Signals be received and recommended as the sense of this Convention, and that the representatives of the different lines be requested to place the matter before their executive officers or boards of directors with a view to the adoption of the same with the fall change of time-tables."

Mr. MCCREA: I would like to say in respect to this report that there has been no small amount of labor performed in connection with it, and Mr. J. J. TURNER, Superintendent of the Indianapolis & Vincennes Railroad, has been of the greatest assistance to us. I think that his name should be added to the Committee, and if there is any credit for what has been done he should share it.

Mr. Turner was added to the Committee by unanimous consent.

A vote of thanks to the Committee was then adopted, and the Committee requested to continue in office.

STANDARD TIME AGAIN.

Mr. J. M. TOUCEY: Mr. Chairman, there has been a great deal of discussion in the newspapers in regard to standard time as to who should have the credit for the work that has beend one. In view of that discussion, and for the purpose of authoritatively settling the question as to who was the most active agent in devising the system and securing the adoption of standard time, which has been adopted as the result of the action of this Convention, I move the adoption of the following resolution:

"*Resolved*, That we hereby declare that the Secretary of this Convention, Mr. W. F. Allen, is the person whom we recognize as the originator of the system, based upon the hour theory, which we have adopted; and as we delegated to him the sole duty of securing its adoption, his successful services in the performance of that duty should be, and are hereby fully acknowledged."

This resolution was unanimously adopted.

Mr. ALLEN: It is hardly necessary, gentlemen, for me to state how gratifying this action of yours is to me personally, and how highly I appreciate it.

Mr. TOUCEY moved that the next Convention be held at the Continental Hotel, Philadelphia, Thursday, Oct. 9, 1884, which was agreed to.

Mr. PUGH: Mr. Chairman, the various proceedings of our Conventions involve more or less expense, aggregating last year a considerable sum of money. The form of assessment heretofore prevailing does not seem to be very equitable, and it is certainly very uncertain in its operation. The Secretary is obliged to make an arbitrary assessment for each copy of the proceedings furnished, there being no other way to adjust the matter as it now stands. It seems to me to be quite proper that this Convention should have a moderate amount on hand in its treasury, to be used for any purpose which might be required. I would therefore move that a committee of five be appointed by the Chair to consider the question of an equitable manner of assessment to cover the expenses of this Convention, the committee to report at the next meeting.

Adopted. The Chair appointed Messrs. Chas. E. Pugh, J. M. Toucey, Chas. Stiff, E. B. Thomas and K. H. Wade as the Committee.

Mr. Toucey offered the following resolution, which was adopted:

"*Resolved*, That the thanks of this Convention are tendered to the proprietors of the Grand Hotel for their cordial and satisfactory attention in providing facilities for the meeting of the Convention and for courtesies to the members thereof."

On motion, the Convention adjourned.

THE VOTE ON THE PROPOSED TRAIN SIGNALS.

An appendix to the report of the Committee on Uniform Train Signals gives the following summary of the votes received:

SIGNALS.	Total number of roads voting	Total mileage	No. of roads in favor of system proposed	Mileage of roads favoring system	Percentage in favor of system proposed
Hand and lamp	196	58,503	168	46,048	79
Bell cord	196	58,503	167	41,882	72
Whistle	196	58,503	169	42,702	73
Stationary and fixed	196	58,503	163	45,985	79
Torpedo	196	58,503	173	48,877	83
Use of signals	196	58,503	167	51,688	88
Will adopt system if a majority favor it	196	58,503	158	50,034	86
Will adopt if adopted by connecting roads			19	2,389	4

This appendix also contains a full list of the votes, many of them having remarks of the managers of the roads appended. This statement is of interest, but too long for republication here.

ANNUAL REPORTS.

The following is an index to the annual reports of railroad companies which have been reviewed in previous numbers of the current volume of the *Railroad Gazette*:

	Page.		Page.
Atchison, Top. & Santa Fe	64	N. Y., N. Haven & Hartford	27
Camden & Atlantic	195	N. Y., Ontario & Western	108
Charlotte, Col. & Augusta	232	N. Y., Pennsylvania & Ohio	159
Chicago & Alton	146	N. Y., Susquehanna & West	147
Chi., Burlington & Quincy	259	Norfolk & Western	260
Chi., Milwaukee & St. Paul	87, 241	Northern Central	165
Cin., New Orleans & Tex. Pa	164	Pennsylvania & New York	140
Cin., Wash. & Baltimore	46	Pennsylvania Railroad	181
Cleveland, Col., Cin. & Ind	278	Perkiomen	87
Cleveland & Pittsburgh	46	Petersburg	47
Columbia & Greenville	87	Philadelphia & Reading	27, 64
Columbus, Hocking Vy. & Tol	202	Philadelphia, Wil. & Balt	196
Connecticut River	64	Pittsburgh & Castle Shannon	164
Consolidation Coal Co	261	Pittsburgh & Lake Erie	47
Cumberland Valley	259	Pittsburgh, McK. & Yough	63
Dela. & Hud. Canal Co	140, 259	Portland & Ogdensburg	87
Delaware, Lacka. & Western	165	Portland & Rochester	107
Fitchburg	47	Providence & Worcester	64
Hartford & Conn. Western	165	Richmond & Danville	23
Housatonic	196	Rochester & Pittsburgh	241
Houston & Texas Central	241	St. Louis, Vandalia & T. H	196
Huntingdon & Broad Top Mt	107	St. Paul & Duluth	147
Illinois Central	164, 202	Sandy River	87
Kentucky Central	279	South Carolina	105
Knox & Lincoln	87	Texas & Pacific	195
Lehigh Coal and Navigation Co	147	Troy & Greenfield	46
Lehigh Valley	47, 139	Union Pacific	195, 202
Mexican Central	279	Utica & Black River	87
Milwaukee, Lake Sh. & West	279	Western Maryland	8
Mississippi & Tennessee	8	West Jersey	87
Missouri Pacific	26	West Va. Central & Pittsburgh	46
New Haven & Northampton	147	Wilmington, Col. & Augusta	8
N. Y., Lake Erie & Western	231	Wilmington & Weldon	9

Denver & Rio Grande.

At the close of its last fiscal year, Dec. 31, 1883, this company owned 1,317 miles of railroad (of 3 ft. gauge) in Colorado and New Mexico, an increase of 35 miles during the year. It also leased the Denver & Rio Grande Western road, from the Colorado line to Ogden, Utah, 362 miles, making 1,679 miles worked. The leased line was extended 207 miles during the year. The average mileage for the year was 1,559 miles, against 1,165 miles in 1882.

The equipment consists of 242 locomotives; 96 passenger, 12 chair, 2 combination, 2 observation, 19 mail, 29 baggage and 21 express cars; 2,674 box, 447 stock, 1,424 flat, 1,252 coal and ore, 44 refrigerator and 86 caboose cars; 3 wrecking and 58 construction cars.

The general account, condensed, is as follows:

Stock (including $990.80 fractional certificates)		$35,500,990.80
Funded debt		26,123,000.00
Rolling stock trusts		4,028,000.00
Accounts and balances, accrued interest, etc		2,377,685.20
Sundry accounts, in suspense		86,814.44
Profit and loss, balance		145,404.21
Total		$68,261,894.65
Road and equipment	$55,802,245.71	
Equipment covered by trusts	5,358,455 64	
Unfinished lines	2,468,843.38	
Materials	801,747.04	
Securities on hand	1,275,000.00	
Rio Grande Western Con. Co	475,781.25	
North Am. Investment & Promoting Co	753,909.14	
Colorado Coal & Iron Co	282,808.50	
Cash and accounts receivable	1,043,103.39	
		$68,261,894.65

The funded debt consists of $6,382,500 first-mortgage bonds and $19,740,500 consolidated bonds. There were also $2,500,000 general mortgage bonds authorized and subscribed for, but these are not included in the accounts, as they had not been issued on Dec. 31.

The total amount of rolling stock trust certificates issued has been $5,185,500. Of these $1,157,500 had been paid off to Dec. 31 last, and $389,000 remained in the treasury unsold, leaving $3,639,000 actually outstanding.

The earnings for the year were as follows:

	1883.	1882.	Inc. or Dec.	P.c.
Freight	$5,351,912	$4,412,186	I. $939,716	21.3
Passengers	1,472,503	1,589,558	D. 117,055	7.4
Mail and express	413,483	357,590	I. 55,893	15 6
Miscellaneous	123,648	45.646	I. 78,002	170.9
Total	$7,361.546	$6,404,980	I. $956,566	14.9
Expenses	4,743.112	3,821,124	I. 921,988	24.1
Net earnings	$2,618,434	$2,583,856	I. $34,578	1.3
Gross earn. per mile	4,722	5,823	D. 1,101	18.9
Net " "	1,680	2,349	D. 669	28 5
Per cent. of exps	64.43	59.66	I. 4.77	....

The earnings last year included government business as follows: Troops, $21,289; government freights, $45,575; mails, $119,972; making a total of $186,836 for the year.

A condensed statement of the income account is as follows:

Net earnings for the year		$2,618,434.09
Union Pacific settlement, proportion		114,531.06
Total		$2,732,965.15
Denver & Rio Grande Western rental	$317,752.39	
Interest	2,036,813.84	
Taxes, insurance, etc	246,234.45	
		2,600,800.68
Balance, surplus for the year		$132,164.47

The earnings of the leased Denver & Rio Grande Western road (included above) were $805,767; the actual working expenses were $802,026, leaving the net earnings only $3,741. The rental (40 per cent. of gross earnings) was $322,307, showing a loss of $318,566 for the year.

A division of the expenses last year is as follows:

	Total.	Total pass.	Total freight.	Per pass. mile. cts.	Per ton-mile. cts.
Conducting transportation	$1,191,245	$476,153	$715,092	1.76	0.37
Motive power	1,449,337	468,723	980 614	1.14	0.51
Maintenance of cars	380,199	96,424	283,775	0.24	0 15
Maintenance of way	1,440,951	576,382	864,569	1.41	0 44
General expenses	281,380	112,043	168, 37	0.27	0.09
Total	$4,743,112	$1,730,225	$3,012,887	4.22	1.56

The chief increase in expenses was in motive power and maintenance of way. There was a comparatively smaller increase in conducting transportation, and an actual decrease in maintenance of cars.

The traffic for the year was as follows:

	1883.	1882.	Inc. or Dec.	P. c.
Passenger	1,990,501	.....	.. ..	....
Freight	3,328,767	.....	.. ..	....
Service and switching	1,954,661	.....	.. ..	....
Total train miles	7,273,929	.....	.. ..	....
Passengers carried	416.928	446,261	D. 29,333	6.6
Passenger-miles	41,006,015	31,030,209	I. 9,975,806	32.1
Ton freight carried	1,416,426	1,151,330	I. 265,096	23.0
Ton-miles	193,178,436	120,733,211	I. 72,445,225	60.0
Av. train load;				
Passengers, No	21	.....	.. ..	. ..
Freight, tons	58	.....	.. ..	....
Av. rate;				
Per passenger-mile	3.60 cts.	5.12 cts.	D. 1.52 cts.	29.7
" " net	*0.62 "	1.69 "	.. ..	...
Per ton mile	2.77 "	3.65 "	D. 0.88 "	24.1
" " net	1.21 "	1.39 "	D. 0.18 "	12.9

*Less.

Locomotive service cost 17.64 cents per mile run last year. The average passenger journey was 98.35 miles; the average freight haul 136.40 miles.

The chief cause of the great reduction in the average rates was the cutting of rates on Utah business which prevailed for a considerable part of the year. Some of it was also due to the necessity of reductions to increase business and maintain local industries on the line of the road. For this road the period of very high rates is gradually passing away, as it has already done for roads further east.

The chief items of freight carried were 654,271 tons of coal and coke; 226,181 tons ore and bullion; 102,952 tons stone, sand and clay and 61,955 tons iron ore, these four making 73.8 per cent. of the total tonnage.

The General Manager's report states that during the past year 35.45 miles of road were built, making the total mileage in Colorado and New Mexico at the close of the year 1,317 miles. The work of improving the alignment and grades was continued during the year, chiefly between Pueblo and Cañon City and in Marshall Pass and Grape Creek Cañon. Steel rails 40 lbs. to the yard were laid in place of worn-out iron rails on 34 miles of the road. There were also 11 miles of 45-lb. rails put down on the Marshall Pass, the steel originally laid being too light for the heavy engines required to be used on the grades over those passes. Much work has been done in replacing pile bridges with truss bridges of wood or iron. It has been found that pile bridges are not suitable for the mountain streams, over which most of the crossings of the road are built. Contracts have been let for a new line between Delta and Grand Junction which will require the construction of about four miles of new road, including a tunnel 2,200 ft. long, but will avoid the maintenance of no less than five bridges which are a constant source of trouble and expense from washouts. The maximum grades have been reduced at several points and snow-sheds have been built to a total length of nearly two miles at points where the road is most liable to interruption. Several artesian wells have been drilled on the line where the water supply is scarce, with success, except in one case near the Utah border, where a plentiful supply of water was secured, but of such quality that it was impossible to use it on the locomotives.

The President's report says that $1,000,000 of consolidated bonds were received from the trustees during the year, of which only $119,000 have been sold. It has been resolved hereafter to charge the entire amount of the interest on the bonds against income instead of charging part of the interest to the cost of construction until the mileage under construction was put in operation.

The ratio of gross earnings to mileage has decreased, owing to the reductions made in the rates on coal, coke and ores in order to encourage mining industries on the line, and also on account of the very low rates on Utah business made necessary by the competition of other lines. The latter cause of decrease of earnings has, however, been removed since the close of the year by the conclusion of a pooling agreement under which rates will be maintained and the business fairly divided.

At the date of the last report 155 miles of the leased line in Utah were in operation. About April 1 the line was opened to Salt Lake, 325 miles from the Utah border, and on May 18 the road was completed to Ogden, 362 miles, there making connection with the Central Pacific. The new line has carried its full proportion of traffic, but, as already stated, the rates are for the most part very low. When the leased line was turned over to this company for operation it was in an unfinished condition. The road-bed had been graded, the rails laid, and a few buildings erected, but not surfacing nor ballasting of track had been done; the stations, water stations, and other appliances, were insufficient and not in accordance with the terms of the contract with the construction company. In order to make the bridges secure it was necessary to put a large force at work at once, and in addition faulty engineering and poor construction caused the washing away of numerous bridges on the new line, the replacement of which was mainly charged to operating expenses. For these reasons the expenses of the leased line were very large. The amount expended toward finishing the road in accordance with the contract, and which is collectable either from the construction company or the Denver & Rio Grande Western Co., was $656,371.

The amount expended upon the line owned for straightening curves, reducing the grades and other necessary betterments was $894,733.

On Sept. 26 the board decided to execute a general mortgage on the company's property, including its interest on the lease of the Utah lines, to cover an issue of $50,000,000, in 5 per cent. bonds, having 30 years to run. This action of the board was approved by a special meeting of the stockholders. Bonds under this mortgage can be issued at the rate of $30,000 per mile of road, but a sufficient amount of them must be set aside to cover all the bonds issued under the first and consolidated mortgages. To meet the necessary expenditures the board has authorized the issue of $5,000,000 of these general mortgage bonds and $5,000,000 of the stock of the company from time to time as occasion may require. Of this amount $2,500,000 each of bonds and stock have been issued in accordance with the terms of the circular dated Oct. 11, 1883, which was published at the time. The stock issued appears in the accounts for this year, but the bonds not having been delivered until after the close of the year do not appear in the account. The proceeds of this issue leave the company almost free from the floating debt. The present management has decided that the extent of the purchases in the future will be governed by the company's ability to pay bills when due.

Several matters of account in dispute between this company and the Union Pacific have been amicably adjusted by the payment of $280,000 cash by the Union Pacific on June 14 last, in full settlement of all claims to that date.

Since the formation of the pools the company has been ahead of its allotted percentages, and has been compelled to turn over business to its competitors in adjustment. Business to and from Leadville continues to increase, owing to the increase in output of many of the older mines and discoveries of new mines. It is thought that the character of this district as a permanent mining district has been established. From Durango and Silverton there has been a fair increase in tonnage, and an increase is expected from the Red Mountain district beyond Silverton.

The recent decision of the United States court in the case of the Denver & New Orleans Co. against the Atchison, Topeka & Santa Fe puts this company under a much better footing than has existed for some time regarding the complications of traffic between Denver and Pueblo. The decision is to the effect that a railroad company is not obliged to divide its business as between competing lines, if it does not desire to do so.

The report refers to the retirement of Mr. Palmer from the management of the company and to the changes made in consequence.

St. Louis & San Francisco.

At the close of the last fiscal year, Dec. 31, 1883, this company owned and operated the following lines:

	Miles.
St. Louis to Seneca, Mo	326¾
Granby Branch	1½
Peirce City, Mo., to Wichita, Kan	218¼
Oronogo, Mo., to Joplin	10½
Girard to Galena, Kan. (including Belt Road to Joplin)	4 ¼
Carbon Branch	3¼
Plymouth, Mo., to Fort Smith, Ark	134½
Springfield, Mo., to Chadwick (White River Branch)	34½
Total	776

The Central Division of the Atlantic & Pacific Railroad (operated by this company) has been constructed across the Arkansas River, and the track extended a distance of four miles west of the west bank of the river. This gives this division a length of 102 miles, and makes the total mileage under the sole control of and operated by this company of 878 miles. Trains also run, by contract, over the Atchison, Topeka & Santa Fe Railroad, from Wichita to Halstead (24½ miles).

Additions during the year were the extension of the main line from Pacific to St. Louis, 34½ miles, which was not opened for traffic until Jan. 1, 1884, and the extension of the White River Branch from Ozark to Chadwick, 15 miles. the average mileage worked for the year was 734.46 miles, against 676.68 miles for 1882.

The equipment consists of 85 locomotives; 29 passenger, 10 combination, 5 postal and 12 baggage cars; 1,274 box, 585 stock, 20 flat, 1,000 ore and 49 caboose cars; 2 officers' cars, 1 pay car, 2 tank, 2 wrecking and 5 boarding cars. The company also owns one-half interest in 3 Pullman sleeping cars.

The general account, condensed, is as follows:

First-preferred stock		$4,500,000.00
Preferred stock		10,000,000.00
Common stock		10,500,000.00
Funded debt		22,102,000.00
Other liabilities, including accrued interest and February dividend		2,517,833.30
Income account, balance		1,802,468.23
Total		$51,422,301.53
Road and equipment	$41,384,218.81	
Additional construction accounts	6,163,421.95	
Co.'s stock and bonds owned	561,896.21	
Other stock and bonds owned	880,121.24	
Supplies on hand	99,064.37	
Miscellaneous assets	204,920.58	
Bills and accounts receivable	1,807,596.27	
Cash	321,062.10	
		51,422,301.53

The funded debt includes $7,144,500 South Pacific 6 per cent. bonds; $500,000 A bonds, 6 per cent.; $2,766,500 B bonds, 6 per cent.; $2,400,000 C bonds, 6 per cent.; $1,100,000 Missouri & Western 6 per cent. bonds; $2,000,000 St. Louis, Wichita & Western 6 per cent. bonds; $841,000 equipment trust 7 per cent. bonds; $1,350,000 trust 6 per cent. bonds; $4,000,000 general mortgage 6 per cent. bonds; a total of $22,102,000, on which the interest charge is $1,334,530 yearly. There were also $2,000,000 additional general mortgage bonds which had been certified by the trustees, but not sold at the date of the report.

Additions to this debt were the sale of $318,000 equipment bonds and $1,500,000 general mortgage bonds. There were $80,000 equipment bonds redeemed and canceled.

Sales of land during the year were 336,273 acres for $485,049, being the largest ever made in one year by the company. They included one sale of 168,535 acres to a Scotch company, which had previously bought other lands, and which is actively engaged in their settlement and improvement. The total receipts from new sales, collections on contracts, royalties, etc., were $645,844; the expenses of the Land Department were $88,880. There remained unsold Dec. 31 last 164,283 acres, of which 162,652 acres belong to the South Pacific grant and 1,631 acres to the Atlantic & Pacific grant. The land assets include the unsold lands, estimated at $246,425; town lots valued at $73,650; bills receivable and land contracts, $632,351; cash, $17,705; a total of $870,131.

The earnings for the year were as follows:

	1883.	1882.	Inc. or Dec.	P. c.
Freight	$2,793,503	$2,648,383	I $145,120	5.5
Passengers	842,266	741,388	I. 100,878	13.6
Mail and express	178,895	147,299	I. 31,596	21.5
Miscellaneous	81,901	35,171	I. 46.730	133.5
Total	$3,896,565	$3,572,243	I. $324,324	9 1
Expenses	1,823,129	1,625,783	I. 197,346	12.1
Net earnings	$2,073,436	$1,946,458	I. $126,978	6.5
Gross earn. per mile	5,305	5,279	I. 26	0.5
Net " " "	2,823	2,876	D. 53	1.8
Per cent. of exps	46.79	45.51	I. 1.28	.....

Expenses as given above include taxes, which were $93,768 last year and $81,126 in 1882, and improvement account, which amounted to $137,202 in 1883 and $89,891 in the preceding year.

The income account for the year was as follows:

Net earnings, as above		$2,073,436.35
Interest and divdends received		24,376.24
Total		$2,097,812.59
Interest and sinking funds	$1,303,579.30	
Rental accounts	39,856.67	
Interest accrued, not due, balance	11,004.17	
Dividends, first-preferred stock	315,000.00	
		1,669,440.14
Surplus for the year		$428,372.45
Balance, Jan. 1, 1883		1,374,095.78
Surplus, Jan. 1, 1884		$1,802,468.23

The surplus for the year was sufficient to pay 4 per cent. on the preferred stock. Dividends amounting to 7 per cent. were paid on the first-preferred stock for the year.

The division of expenses for the year was as follows:

	Total.	Per mile of road.	Per train mile.
Conducting transportation	$498,137	$678	21.22 cts.
Motive power	422,507	575	17.99 "
Maintenance of way	431,052	587	18.36 "
Maintenance of cars	135,739	185	5.78 "
General expenses	104,724	143	4.46 "
Taxes	93,768	128	3.99 "
Improvements	137,202	186	5.84 "
Total	$1,823,129	$2,482	77.64 cts.

Excluding taxes and improvements the working expenses were $2,168 per mile of road; 67.81 cents per train mile, and 5.93 cents per car mile. The train mileage does not include service trains.

The traffic for the year was as follows:

Train miles:	1883.	1882.	Inc. or. Dec.	P. c.
Passenger	728,622	686,911	I. 41,711	6.0
Freight	1,619,382	1,416,414	I. 202,968	14.3
Service	40,556	33,389	I. 7,167	21.7
Total	2,388,560	2,136,714	I. 251.846	11.8
Pass car. miles	3,143,475	2,877,538	I. 265,937	9.2
Freight car miles	23,735,553	20,051,834	I. 3,683,719	18.4
Passengers carried	428,987	348,811	I. 80,176	23.0
Passenger-miles	25,872,527	20,148,500	I. 5,724,027	28.4
Tons freight carried	784,735	753,573	I. 31,162	4.2
Ton-miles	162,384,768	137,334,335	I. 25,050,433	18.2
Av. train load:				
Passengers, No	36	29	I. 7	24.1
Freight, tons	100	97	I. 3	3.1
Av. rate:				
Per Pass.-mile	3.23 cts.	3.68 cts.	D. 0.42 ct.	11.4
Per ton-mile	1.72 "	1.93 "	D. 0.21 "	10.9

Locomotive service last year cost 16 51 cents per mile run. The earnings per train mile were 165.95 cents gross and 98 14 net; per car mile, 14.50 cents gross and 8.57 net.

At the close of the year 620 miles were laid with steel, of which 32 miles are 67 pounds to the yard, 336¼ miles 56 pounds to the yard and 250½ miles 52 pounds to the yard, leaving only 156 miles laid with iron. There have been put down during the year 36½ miles of 56-pound steel rails (with new angle bars and bolts), all charged to operating expenses. There were 181,253 new ties used; 38 miles of track were ditched and 28¾ miles ballasted. There were 7½ miles of new sidings built.

Improvements made include new shops, round-house, and other buildings at Newburg; six spans, 588 lineal feet of new iron bridge; general repairs to other bridges, and repairs and additions to several stations.

There were added to the equipment 6 locomotives, 107 box, 100 stock and 3 caboose cars, besides a number of hand and push cars.

The President's report says: "The crops for 1883, in the regions traversed by the company's lines, were only moderately good. The wheat crop was considerably less in quantity than that of the year before, but the yield of corn was quite satisfactory.

"Owing to the diminished activity in the iron industries of the country at large the customary and important ore traffic of our lines has been during the year greatly curtailed.

"The live stock traffic has been increased during the latter months of the year by reason of the extension of the line of the Central Division of the Atlantic & Pacific Railroad in the Indian Territory, and which continues for the present to be operated by this company. This extension, however, did not reach Red Fork station (on the west side of the Arkansas River) sufficiently early in the year to afford the full measure of advantage in this respect, and such as may be expected hereafter.

"The through service to the Pacific Coast, created by the completion of the Western Division of the Atlantic & Pacific Railroad, between the Rio Grande and the Colorado River, was opened near the close of the year. * * *

"The transfer of our business across the Arkansas River, between Van Buren and Fort Smith, continues to be done by ferryboat, the company having been prevented from building its bridge there owing to a difference of opinion which has existed between the company's engineers and those of the United States government in regard to the proper location. At the date of writing this report the government engineers have finally waived their objections to our location, and the same, as at first decided upon by the company, has been duly approved by the Secretary of War.

"Until the bridge question was satisfactorily settled it was deemed inadvisable to further consider that of building southwardly from Fort Smith, through the Indian Territory, to Paris, Texas.

"The railway to the Eureka Springs has been in successful operation during the past year. It was built by the Eureka Springs Railway Co., of Missouri and Arkansas, under and pursuant to a traffic contract made with this company. The results attained have been quite satisfactory to the proprietors and to our company. Our own lines have enjoyed considerable additional traffic to and from this new line, and we have received the first year's interest (6 per cent.) on the second mortgage bonds of that company, received by us as part consideration for the traffic contract."

RAILROAD GAZETTE

Published Every Friday.

EDITORIAL ANNOUNCEMENTS.

Passes.—*All persons connected with this paper are forbidden to ask for passes under any circumstances, and we will be thankful to have any act of the kind reported to this office.*

Contributions.—*Subscribers and others will materially assist us in making our news accurate and complete if they will send us early information of events which take place under their observation, such as changes in railroad officers, organizations and changes of companies, the letting, progress and completion of contracts for new works or important improvements of old ones, experiments in the construction of roads and machinery and in their management, particulars as to the business of railroads, and suggestions as to its improvement. Discussions of subjects pertaining to* ALL DEPARTMENTS *of railroad business by men practically acquainted with them are especially desired. Officers will oblige us by forwarding early copies of notices of meetings, elections, appointments, and especially annual reports, some notice of all of which will be published.*

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THE COST OF HIGH SPEED.

A few years ago it was very generally considered that fast express trains involved a large amount of wear and tear, and an extravagant consumption of fuel, and that on economical grounds railroad companies would do well to run their trains at a moderate pace. The cost of high speed may be to some extent measured by the increased power that must be exerted by the engine to overcome the increased resistance. It is therefore important to know the laws governing this increase of resistance. The amount of extra power necessary under any given circumstances might then be determined. The weight and kind of cars, the grades, curves and average condition of the road being known, some idea might be formed as to the cost of increasing the speed of an express train, and possibly we might learn something as to the best means of decreasing the resistance or lessening the cost of high speed. Some useful lessons have been taught by the experiments already made in this direction, although they by no means completely solve the question as regards high speed.

The experiments of Mr. P. H. Dudley and others have shown that, as far as freight trains are concerned, the resistance to traction does not materially increase with the speed, and that speed or air resistance—as distinguished from the axle and flange friction which must exist at any speed—does not distinctly begin to show itself till a speed of from 20 to 25 miles an hour is attained. There is, however, a lamentable lack of experiments on the resistance of modern passenger cars at a speed of 50 to 60 miles an hour. D. K. Clark's oft-quoted formula gives $R = 8 + \frac{V^2}{171}$, which may be thus expressed in words: "Resistance in pounds per gross ton weight of engine, tender and train equals 8 lbs., added to the square of the speed in miles per hour divided by 171." This formula is based on results obtained from experiments on trains made over 30 years ago; but the results were found to be practically correct by the late Zerah Colburn, who made a series of observations on the performance in actual service of English outside-cylinder express engines, some 20 years ago. The vehicles were, however, far smaller and lighter than those now in use in Europe, and were of a totally different construction from the modern American car. The use of grease instead of oil boxes, a rigid instead of a flexible wheel-base, and a low flat roof instead of a clear story would naturally lead us to expect widely different results. The whole train, moreover, occupied far less space and exposed much less surface to the air than a modern train of the same weight, passengers then being provided with much less space than is now thought desirable.

The amount of friction produced by a body passing rapidly through the air is manifestly influenced rather by the shape of the body, and the area and smoothness of the external surface than by the weight of the body. Hence the surface presented by the train has more influence on the air resistance than the weight of the cars. As Clark's formula was based on a different relation between the weight and exposed surface from that now existing it is inapplicable to modern trains. Careful experiments made in France some years ago show that the resistance of a train 500 ft. long is not nearly double that of a train 250 ft. long; and MM. Guebhardt and Dieudonné, who conducted the experiments, attribute this to the fact that toward the rear part of a long train the air to some extent adheres to the train, and is dragged along with it, diminishing the friction. If the air on the rear half of the train is being dragged along at an average speed of 30 miles an hour when the train is moving at 60 miles an hour, the friction between the air and train is that due to the difference of their speeds, or 30 miles per hour instead of 60.

Mr. Clark states that the friction of the working parts of the engine, including the axles, was equal to 12 lbs. per gross ton weight of the engine and tender. But this amount has probably been largely reduced by modern improvements in lubrication, larger bearing surfaces, and better and truer workmanship. While Mr. Clark found that the cars required a force of 6 lbs. per ton to keep them just moving, later experiments show that good oil boxes and smooth steel journals reduce this figure to from 2½ to 4 lbs. per ton. The net effect of all these alterations is very uncertain; while the axle friction is undoubtedly diminished, the higher and larger cars offer more resistance to the atmosphere, though this may be counterbalanced by the fact that modern trains are longer, and the rear portion possibly gives a smaller resistance than the rear part of a short train of 30 years ago. The resistance of an express train of the present day can only be definitely ascertained by a series of careful experiments, preferably on a piece of track with a long stretch of level or a slight grade, so as to obtain a uniform speed.

Although the amount of train resistance at high speeds has not of late years received the scientific investigation its importance deserves, some interesting experiments have lately been made on the relative amounts of coal consumed in drawing the same train at high and low speeds. This is, of course, an answer to the practical side of the problem. The cost of high speed is measured more by the coal consumed than by the increased frictional resistance. If this is so much augmented as to be destructive to rolling stock and permanent way, the coal bill will reveal the fact. The increased amount of coal is burnt in order to generate the power to overcome the increased resistance caused partly by the air friction and partly by the increased shocks and blows on the rails and frogs. Probably a given amount of coal develops rather less power at the higher speeds, owing to the loss in wiredrawing the steam through the ports. If this be the case, the consumption of fuel will increase slightly faster than the resistance. The amount of coal burnt may, roughly speaking, be taken as representing the amount of wear and tear, on the principle that wear is chiefly caused by friction, and that the coal is chiefly burnt in overcoming and generating friction. In other words, if an engine burns an increased amount of fuel and generates a correspondingly increased amount of steam in traversing a given distance, the average pressure on the pistons is increased. The wear of many of the working parts (axle boxes, coupling and connecting-rod brasses, etc.) is thus evidently increased, and the same is true to a lesser extent of other important working parts. The quantity of coal burnt in a locomotive boiler has a material influence upon the length of the life of that boiler. Each particle of coal burnt implies a certain amount of wear and tear upon fire-bars, fire-box and tubes, though the quality of the water is, of course, an important factor.

The wear of permanent way is much influenced by the force of the blows and percussions the rails receive from passing trains, and it seems probable that the increased resistance at a high speed is partly due to the increased force of the sliding blows struck against the rails. Careful experiments alone can show how far this action can be neutralized by keeping the road in good line and surface.

Though no definite value can be put upon the relation between coal consumption and the wear and tear on railroad plant that necessitates repairs, yet the fact that there *is* some connection between them is evident. If, therefore, we find that high speed involves little extra coal consumption, the obvious inference is that the amount of wear and tear is but little increased.

Some experiments have been made lately upon the Bound Brook route to ascertain the difference in the consumption of coal between an express train running on schedule time and the same train run at a very low speed, but otherwise under the same conditions, the same five cars and precisely similar engines being used. The trains ran in each case from Philadelphia to Bound Brook and back, a distance of 119 miles. The slow trip was made in 9 hours 23 minutes, 4,420 lbs. of coal being consumed. The train stopped at the same places as the regular express trains, the only unusual feature of the trip being the funereal pace, averaging a little over 12¼ miles an hour. When running on schedule time the consumption was 6,725 lbs., agreeing closely with the usual consumption on this route with the regular five-car express trains. The saving effected in coal by running the train at a very slow pace was consequently 2,305 lbs. The percentage of saving may be expressed in two ways: as compared with the consumption at the normal express speed, the slow speed shows a saving of 34.2 per cent., while the consumption at the high speed shows an increase over that at the low speed of 52.1 per cent.

These figures show that high speed is not so expensive as is generally imagined. The speed of 12.5 miles an hour for a through passenger train making few stops is, of course, impracticable, for various reasons. Probably the difference in coal consumption between the lowest speed practically possible under ordinary conditions and a high express speed is even smaller than the figures given, which represent a lower speed than is ever attained on an ordinary railroad.

Taking the average speed of the fast trip at 55 miles an hour, and allowing in each case a fixed quantity, say 4 lbs. per ton, for the effects of gradient, the resistance per ton of this particular train at the slow speed should, according to Clark's formula, be 13¼ lbs. per gross ton, and at the high speed be 31 lbs. per ton; in other words, the resistance at the high speed should be more than double that at the low speed. But the relative consumption of coal shows that if this is the case the locomotive is able to overcome a large increase of resistance with a comparatively small increase of fuel consumption. If the slow speed resistance is 13¼ lbs. per ton the resistance at the high speed should be about 20 lbs. per ton instead of 31 lbs., if it were in proportion to the coal burned to overcome it. Probably all these figures are too high, and the resistance at the low speed, including an allowance for gradients, does not exceed 9 lbs. per ton; and if this is the case the resistance at the high speed should be rather less than 14 lbs. per ton. In noticing* a 300-mile run made by Mr. F. W. Webb's compound engine taking the Scotch express, we assumed that the average resistance of that train was about 14 lbs. per ton, and we think the experiments on the Bound Brook route tend to confirm the accuracy of our estimate as to the resistance of an express train in England, the results being similar, though arrived at by different methods. The relative weight, speed and construction of the two trains, and the gradients over which they run, differ in such a manner that the resistances should be approximately equal. But here again we are left without any trustworthy guidance, and have to depend on surmise, no indicator or dynamometrical diagrams having been taken in either case to ascertain the resistance of the train or the amount of power exerted by the engine.

The results of the experiments with passenger trains on the Bound Brook route are, to a certain extent, confirmed by some recent experiments made on another line on the consumption of coal at different speeds. In this case trains of empty coal cars were experimented on at speeds of 6.7 and 20 miles an hour, respectively. The same engine and cars were used in each case. The conditions were rather unfavorable to the higher speed, the empty coal cars presenting a far larger surface to the wind than the same total weight of loaded cars. The engine was designed only for switching purposes, having 16 in. × 18 in. cylinders, and 43 in. wheels, and was not intended to haul a heavy train at a fair main-line speed. The relative consumption at the two speeds bore, however, almost the same proportion as the consumption with the two passenger trains on the Bound Brook route. The quantity of coal consumed at the speed of 20 miles an hour was 59.3 per cent. in excess of that consumed at 6 7 miles an hour. Running the train at this slow speed effected a saving of 37.2 per cent. of the coal burnt at the higher speed. The results agree very closely with those obtained with the passenger train, where the percentages were 52.1 and 34.2 per cent., respectively.

High speed to a certain extent diminishes both the number of men and amount of rolling stock necessary to carry a given traffic; and this saving must be set against the increase in coal consumption and wear and tear. In the case under notice, at a slow speed, the run of 119 miles would make a very fair day's work for both train-men and train; whereas, at the normal

*See *Railroad Gazette* for Feb. 22, 1884.

speed, allowing for the necessary delays at stations, switching, turning and loading engine, etc., quite double the mileage might be made in a day. As engine-men are ordinarily paid by the trip, this would not reduce their wages unless some change were made in the practice, but probably some change would be made if runs which now require six or seven hours were reduced to four or five. Double the amount of rolling stock being required, the round-houses, etc., must be larger and the sidings in which to store the cars must be longer. The interest on the additional rolling stock and plant would thus amount to quite a large figure. In some cases the slower train might actually be the more expensive to run, leaving on one side all questions as to the convenience of rapid traveling and its effect in increasing the volume of travel. On the whole, the result of these experiments seems to be strongly in favor of high speeds for both passenger and freight trains.

The Effect of the Reduction in East-bound Rates.

The effect of the reduction in east-bound rates to 15 cents per 100 lbs. from Chicago to New York and the great fall in the price of wheat is seen very plainly in the shipments from the Northwestern markets, which for the last five weeks reported have been :

	March 8.	March 15.	March 22.	March 29.	April 5.
Flour, bbls.	126,090	222,496	224,821	239,950	249,879
Grain, bu..	2,697,966	3,359,514	3,339,566	4,176,111	4,344,131

There has been comparatively little change in the shipments of flour, which is likely to go forward about as fast as it is made, but flour may practically have had the benefit of the reduced rate before the reduction was openly made; the reduction to 15 cents March 20 has been followed, however, by an increase of 837,000 bushels the first week and 1,005,000 the second week in the shipments of grain of all kinds, and these are among the largest rail grain shipments ever made in a week.

But, as we have shown heretofore, the grains have not been all affected alike. The shipments of each in each week have been :

Weeks to	Wheat.	Corn.	Oats.	Barley.	Rye.
March 8	296,489	1,602,434	638,957	130,077	30,009
" 15	409,266	2,164,333	727,503	111,668	46,754
" 22	482,812	1,909,591	695,582	92,605	158,706
" 29	846,210	1,823,354	1,233,167	116,797	157,583
April 5	1,419,891	1,384,891	1,297,910	126,447	114,812

Thus the increase has been substantially wholly in wheat and oats. Compared with the receipts March 22 there is in the last week an increase of 937,000 bushels (195 per cent.) in the wheat shipments and of 602,000 (86½ per cent.) in oats; but there is a *decrease* of 524,700 bushels (27¼ per cent.) in the corn shipments. The low rates have started forward the accumulated stocks of wheat and oats, but they have not stimulated shipments of corn, of which there was no great accumulation at the markets, while the stock in farmers' hands is not marketed freely at this season, when the farmers are engaged in the field, and they probably have not any great surplus to spare—not enough to make them hasten to take advantage of a 15-cent rate.

The fall in prices, which has been very great in wheat but small in corn, has been adduced as a reason why the receipts of the Northwestern markets should decrease. They have decreased, and for five successive weeks have been, in bushels :

Week ending.				
March 8.	March 15.	March 22.	March 29.	April 5.
4,706,048	4,902,106	4,486,653	4,171,067	3,318,127

The fall in prices has taken place since the middle of March.

As in the last week a third less was received than in the week ending March 15 this seems to confirm the assumption as to the effect of the fall of prices on the receipts of the places which receive from the farmers.

But if we examine the receipts of wheat, the price of which has fallen off about one-sixth, we find them to have been :

Week ending				
March 8.	March 15.	March 22.	March 29.	April 5.
607,511	673,801	574,961	493,354	466,844

Thus the deceease in wheat since March 22 has been 108,117 bushels.

Now the receipts of corn, the price of which is but little changed, have been :

Week ending				
March 8.	March 15.	March 22.	March 29.	April 5.
2,946,012	2,082,430	2,502,471	2,010,855	1,447,083

Thus the corn receipts since the week ending March 22 have fallen off 1,055,388, which is nearly *ten times as much* as the decrease in wheat receipts.

The effect of the high price of wheat on our exports has been especially deplored, and many rejoiced at the fall as likely to cause an important export movement. The fall in price occurred early enough to have been felt in the exports of the Atlantic ports for the last two weeks reported. These exports for five successive weeks have been;

	Week ending				
	March 8.	March 15.	March 22.	March 29.	April 5.
Flour, bbls.	108,873	148,068	131,051	116,748	102,005
Grain, bu..	1,412,281	1,561,846	1,150,945	1,528,991	1,281,068
Wheat, bu..	480,098	523,704	347,071	607,947	503,388

Thus the exports of all grains in the last week were smaller than in either of the two before the prices of wheat and flour fell, and the exports of flour smaller; those of wheat about the same; and, so far as appears from the movement, exports have not been stimulated at all by the great fall in prices.

As the 20-cent rate went into effect March 13, and the 15-cent rate March 20, and grain reaches the seaboard from the most distant of the reporting Western markets in a week or less, we might expect to see the low rates and low prices result in an important increase in the receipts at the Atlantic ports in the last week reported, especially as we know that there has been a great increase in the shipments eastward from the Western markets. But the Atlantic receipts have been:

Week ending.				
March 8.	March 15.	March 22.	March 29.	April 5.
1,721,499	2,047,942	2,606,217	2,823,541	2,887,282

In the week to March 22 there was a gain of 560,000 bushels over the previous week and of 885,000 over the week to March 8; but these gains were in a week when no shipments at the 15-cent rate could have reached the seaboard, and in the last week, when we should expect that the receipts were wholly of grain shipped at that rate, the gain is comparatively but trifling. Assuming that grain shipped from Chicago, St. Louis, etc., during one week would substantially all be able to reach the seaboard during the following week, we shall see that while the Northwestern shipments were 3,340,000 bushels in the week to March 22, the Atlantic receipts were 2,824,000 the following week, but while the Northwestern shipments increased 836,000 bushels the following week the Atlantic receipts increased only 64,000 bushels.

If we consider the receipts of flour and wheat only at the Atlantic ports, however, we shall see a more notable increase, as follows:

Week ending.				
March 8.	March 15.	March 22.	March 29.	April 5.
206,846	206,058	232,991	291,778	243,251
289,284	354,405	441,453	703,457	1,025,199

The *wheat* receipts under the 15-cent rate (week to April 5) were 132 per cent. more than those nominally under the 30-cent rate (week to March 22), and apparently nearly the whole increase of wheat shipments from the Northwest went through to the seaboard.

We conclude from this that the effect of the reduction in rates, which applied to corn as well as wheat, was very much less than the effect of the fall in the price of wheat in the Northwest. A change in the price for transportation from Chicago to New York, equal to a reduction of 14 per cent. in the New York price of corn, has been followed by a *decrease* of nearly 30 per cent. in the shipments of corn; and to cause the large increase in wheat shipments there has been, besides the decrease in the rate from Chicago to New York, equal to 8 per cent. of the New York price, a decrease of 17 per cent. in the Chicago price. While there has been a great increase in the Northwestern shipments there has been comparatively a small increase in the Atlantic receipts, and no increase in the exports. Indeed, scarcely anything has happened that was to be expected from the great reduction in rates and the greater reduction in prices except the removal of two or three millions of bushels of wheat from the overflowing Western elevators.

Decreasing Importance of Chicago Shipments.

The Chicago through rail shipments eastward during the month of March for six successive years have been, in tons :

1879.	1880.	1881.	1882.	1883.	1884.
258,458	318,983	212,021	179,045	308,354	258,479

Thus the shipments this year were more than in 1881 and 1882, the same as in 1879, but 60,500 tons less than in 1880 and 50,000 less than in 1883, when 15,000 tons are allowed for shipments by the Nickel Plate, which was not then in the pool and did not report its through shipments exactly.

The rates at which the March shipments were carried were badly demoralized in 1879, and estimated to be as low as 17¼ cents per 100 for grain; in 1880 the rate was 35 cents, which was apparently well maintained, for all the roads were crowded with traffic; in 1881 the rate was also 35 cents in March, but there were considerable shipments at cut rates; in 1882 the regular rate was 20 cents till the 25th, and 25 thereafter; but probably a considererable part of the shipments were on contracts at much lower rates made early in the year; last year the rate was 30 cents and there was little complaint of cutting; this year the rate was nominally 30 cents until March 13, but it was probably very little observed; the open reduction to 20 cents March 13 was followed by only a moderate increase of shipments, which indicates that this rate was somewhat lower than the average actually paid previously, but not very much; the reduction to 15 cents March 20, however, was followed by a very large increase of shipments. Doubtless very few shipments had been made at a rate as low as 15 cents previous to the reduction, but probably a great fall in the price of wheat at Chicago just after the reduction in the rate had more to do with the increase in shipments than the lower rates, as is indicated by the fact that the chief gain was in flour and wheat, while there was actually a decrease in the corn shipments.

For the three months ending with March the Chicago shipments have been, in tons :

	1879.	1880.	1881.	1882.	1883.	1884.
Jan.....	192,512	163,378	263,872	321,148	272,162	208,060
Feb.....	198,541	166,541	204,331	225,816	234,232	170,077
March ...	258,458	318,983	212,021	179,145	308,354	258,479
Total...	649,511	648,902	680,224	726,109	814,748	634,616

Thus the shipments of the quarter this year were less than any other of the six, though there are three more roads to carry the traffic than in 1879 and 1880, and one more than last year (the Nickel Plate's light shipments last year having been included). The average rates received were perhaps as great as in 1879, and certainly greater than in 1882, but much less than in the other years, and the net earnings from the traffic were doubtless materially less than in any other year except 1882, when there was probably a loss on the business in January and February. For the six older roads the amount of net earnings on the Chicago shipments this year must have been very much less than in any other year except 1882, and but a small fraction of their profit in 1880, 1881 and 1883. Everything has combined to reduce them—a smaller total traffic, lower rates, and a larger number of lines to divide the business. The Michigan Central, for instance, in 1880 had 31 per cent. of 329,929 tons carried at $8 per ton, and of 318,983 tons carried at $7 per ton to New York, which should have yielded it about $422,000 in the three months.

What share it is to receive of the shipments this year is not yet finally settled, the subject being now before the arbitrators; but it has actually carried only 13.3 per cent. of the entire 634,616 tons, amounting to 84,615 tons, against 201,159 tons allotted it in 1880; and at the rates actually received probably its earnings from this traffic this year over the line which it worked in 1880 (that is, excluding the Canada Southern), probably yielded no more than about $118,000. Very likely it may be awarded more than it has carried, but any probable percentage of the light traffic of the last quarter, at the rates received, must yield but a very small fraction of its total earnings. This, it should be borne in mind, is exclusive of the live stock shipments from Chicago, which continue large, and on which the rates are probably much better than the freight rates.

The three months in question are the quarter of the year when the through railroad shipments are unusually largest, the rates highest and the profits largest. The Michigan Central, however, suffered a large, decrease doubtless (in comparison with 1880, when the winter traffic was most profitable) than any other road, largely because it then had much the largest share of the traffic. The Chicago & Grand Trunk, which was first awarded a share of the traffic later in 1880, and in the first quarter of this year actually carried 14.2 per cent. of the whole, has taken its traffic chiefly from the Michigan Central, and the Nickel Plate on the other side of it has perhaps affected the Michigan Central more than any other road except the Lake Shore. The *gross* loss of some of the other roads may very likely be more than the Michigan Central's, as the Lake Shore has a haul of 540 and the Fort Wayne a haul of 468 miles, against the Michigan Central's 284 (exclusive of Canada Southern, which cannot be included in comparison with years previous to 1883). But the important thing shown by the comparison is not the gain or loss of any one road so much as the fact that the enormous Chicago shipments have become comparatively unimportant to any one road. They would, of course, have yielded much greater profits had full rates been obtained last winter, but probably no one expects to get even as high average rates hereafter for the seven or eight months the navigation is open as were actually obtained last winter. For the coming season 20 cents seems to be all that is hoped for, though of course an advance may be possible in the fall. Very likely 25 cents could be had easily for all but the export grain, but no one seems ready as yet to propose lower rates on exports than on other shipments. But with the shipments divided among eight roads and the aggregate hardly as great as when there were but five roads, even at

tolerable rates this traffic ceases to have the transcendent interest that it once possessed. It will probably be long before any one is tempted by it to build into Chicago another road of any considerable length for the purpose of sharing it.

The New York *Evening Post* has published some arguments to show that the low rates on the through east-bound business will not cause a very serious loss to the railroads after all, because the traffic affected is not very great, which it supports by citing certain "statistics," examples of which are as follows:

The New York Central in its last fiscal year, it says, carried 10,892,440 tons of freight, of which but 1,813,320, or 16 per cent., were through freight. Judging from the experience of other roads that report through and local rates, its through rates must have been the lower, "and consequently that the New York Central revenue from through freights in the last year to Sept. 1 [meaning Sept. 30], did not exceed 16 per cent. of its total revenue from freights," which would be about $3,200,000.

Now every ton of through freight over the New York Central goes 440 miles, and so the 1,813,000 tons last year made 797,720,000 ton-miles; but the total ton-mileage was 2,200,900,000, so that what the company reported as "through" was 36 per cent. instead of 16.

Further, it reports as "through" only freight going between the Buffalo or Suspension Bridge terminus and the New York terminus. But it carries an enormous traffic between Albany and its western termini which is subject to through rates the same as the New York freight. The company reported this Albany through freight for 1879-80, and then it amounted to 2,079,558 tons, against 2,024,778 of the New York through freight, and together this through freight amounted to 1,520,637,000 ton-miles, and was *sixty* per cent. of the total freight traffic of the road. But this by no means covers the whole of the freight affected by through rates. The company competes with other roads for through freight at the most important cities on its line, and with the canal at a very large proportion of its stations. The rates to these places on a very large proportion of the traffic move up and down with the through rates, even when they are not actually based on the through rates; and the through rail rates substantially fix the canal rates; that is, the boats charge less when the railroads charge low than when they charge higher rates. This makes the through rates more important than the *Evening Post* indicates them to be; and not only on this road, but on most others which it considers. The Pennsylvania's through tonnage, for instance, it finds to be only 9 per cent. of its total tonnage. This company's report gives the through tonnage-mileage separately, from which it appears that in 1882 it was 24 per cent of the whole on the Pennsylvania Railroad Division, 41¼ on the United Railroads of New Jersey, and 51¼ on the Philadelphia & Erie, and this in spite of the fact that nearly three-fourths of the Pennsylvania Railroad Division and three-fifths of the United Railroads of New Jersey are branches.

In fact, the attempt to show that the through traffic is not very important may as well be given up. We may not be able to measure the amount of it exactly, or say what difference is made in the profits by a change from a 30 or 25-cent rate to a 15-cent rate. But there is one place where the facts are recorded, and Mr. Fink, the one person to whom these records are accessible—exact records, supplied at first hand from the railroad companies themselves—after the railroad war of 1881 calculated that with a rate of 30 cents from Chicago to New York the east-bound traffic covered by the pool would have produced $51,000,000 in 1880, and that a difference of 10 cents per 100 lbs. in the rate on this through freight amounted to $17,000,000, about one-half of which would have fallen on the trunk lines east of Toronto, Buffalo, Pittsburgh and Wheeling. The earnings on the west-bound freight are not so great, but when rates are reduced on this traffic the reduction is often two, three or more times 10 cents per 100. All the decrease in rates is a decrease in profit.

Relatively the traffic is less important now than it was, doubtless, because new roads have diverted much of the through but as yet not much of the local traffic, but it will take away an enormous share of the net earnings of many roads if they can get but 15 cents per 100 for carrying east-bound freight from Chicago to New York. It is not at all likely that they will be driven to that, however, except for a short time.

There has been a good deal of needless lamentation at the "spoiling of the market for our grain" by the high prices made by speculators. It some how seems to be believed that these high prices have prevented the farmers from selling their crops. That is not usually the effect of high prices, and it has not been this year. It will be remembered that the crop of wheat in 1883 was but 420 million bushels, against 504 million in 1882. Now the receipts of wheat at the eight reporting Northwestern markets from Aug. 1 to April 5 for four years have been, in bushels:

1883-84.	1882-83.	1881-82.	1880-81.
59,698,013	64,141,234	33,881,573	63,347,918

A decrease of only 4½ millions in the receipts when there was a decrease of 84 millions in the crop indicate that the farmers took advantage of the high prices which the speculators kindly made for them, and marketed an unusually large proportion of their crop this year before waiting for prices to fall.

The crop of marketable corn was much less in 1883 than in 1882, and, moreover, when the crop of 1882 ripened the markets were so bare of corn (owing to an extraordinarily light crop the year before) that it was hurried forward as soon as it was fit to ship in unusual quantities. Little of the new crop of corn is shipped till January. The receipts of this grain at the Northwestern markets for the three months from Jan. 1 to April 5 for four years have been, in bushels:

1884.	1883.	1882.	1881.
36,303,107	37,095,137	22,751,488	21,759,077

Thus the high prices did not prevent the farmers marketing their grain. Indeed, it is hard to see how they could have done much better considering the smallness of their crops.

Nor have the shipments of the Northwestern markets been exceptionally light. They have, on the other hand, been heavy, though not enough so to prevent a great accumulation of one grain, wheat, in the Western elevators. Apparently the only people who have suffered much by the high prices which the speculators made are the speculators themselves. A few millions of their money has gone into the pockets of the farmers, where it map be quite as useful to the country, perhaps, as if the grain dealers still had it or had increased it. About 213 million bushels of grain have been received at the Northwestern markets since last July. If after getting good prices for this vast quantity the farmers are compelled to accept a low price for what little they have left, and the speculators lose all at once some 17 cents a bushel on 30 millions of wheat which they had in store, we can hardly call the recent high prices a national calamity, unless we call the speculators the nation.

An advance in east-bound rates is desired by all the roads, but some prefer that it should not be made until some means are adopted which will make future irregularities less probable. Among the measures under consideration is the pooling of the shipments from several interior points, the chief of which are Peoria and Indianapolis, and until this is effected it is very likely that consent to an advance cannot be secured.

Mr. Wm. H. Vanderbilt has directed a communication to shareholders of the Chicago, Rock Island & Pacific Company asking for their proxies to vote at the June election, when the terms of four directors expire. The retiring directors are Francis H. Tows (the Secretary and Treasurer), James R. Cowing, Jay Gould and H. H. Porter. Mr. Vanderbilt tells the stockholders that he and many other stockholders do not think Mr. Porter worthy of their support for re-election, and that he will vote his shares and those for which he is given proxies for Mr. John Newell, of the Lake Shore Company in place of Mr. Porter, but will support the rest of the regular ticket. He does not in this letter give any reasons for his objections to Mr. Porter, simply saying that "he was President of the Omaha road until one year ago and has been for some time a director of the Chicago & Rock Island Company."

This is a frank and open way to seek the removal of an objectionable director, and it would be healthier for railroad companies if such contests were commoner—if open, instead of secret means were taken to secure change in management. It would be likely to make the small shareholders familiar with the questions of management that affect their roads, and of the differing opinions concerning the merits of those who conduct their business—of which at present they frequently know virtually nothing, because they hear nothing said about it. But for this we need not only contests, but discussion. If Mr. Vanderbilt had said in his request for proxies just what it is that he objects to in Mr. Porter he would help them to act intelligently in the matter. If it is simply an objection to his character, it might be illustrated by giving passages in his history which show what his character is; but if it is his policy as a director of the Rock Island Company that is objected, there should be a definite statement of what that policy has been and how it has injured the company, and in what particular it is intended to change or modify it. It is true that, in the course of the controversy between Mr. Vanderbilt on the one hand and Mr. Porter and Mr. Cable on the other, some of Mr. Vanderbilt's objections have been made generally known. But there should be a more definite statement of the reasons why a director is to be left out when asking for the proxies of stockholders.

The Northern Pacific shows the influence of spring (and of the rush to the Cœur d' Alène gold placers) in a marked degree in the first week in April, when its earnings were $317,600, against a weekly average of $203,723 in March, $125,107 in February and $127,694 in January. The increase over last year in the first week of April was 84 per cent., while the increase in mileage was only 46 per cent. One swallow does not make summer, but there has all along been reason to believe that just as soon as the road to the Cœur d' Alène district was fairly practicable there would be a great rush of people thither, and all must go over this railroad, and many a long district over it. But it is in the early spring also that immigration begins to be active. Heretofore the earnings of this road have increased rapidly from February to June, as follows:

	Feb.	March.	April.	May.	June.
1880.....	$77,259	$119,358	$186,074	$217,613	$253,105
1881.....	78,893	162,984	216,210	317,705	412,024
1882.....	268,935	373,141	451,023	616,231	704,617
1883.....	369,621	573,709	660,412	789,946	829,657
1884.....	518,300	902,200	*1,360,000	.....	.....

*At the rate of the first week they will amount to this.

Heretofore the earnings have been from 20 to 50 per cent. more in April than in March. At the rate of the earnings of the first week, they will be $1,360,000 this year in April, or 50 per cent. more than in March. This is more than the road has ever earned in a single month, however, the greatest amount heretofore having been $1,324,000, last October.

There remain but three months more of the fiscal year, whose earnings were officially estimated last September as $15,000,000 gross and $6,000,000 net. For the nine months ending with March the gross earnings have been $8,655,477, the last quarter having yielded only $1,986,000. It will not be surprising if in the last quarter (ending with June) the earnings should amount to $4,500,000; if the new mining district should prove profitable possibly they may even be considerably more; but so much depends upon the immigration to North Dakota, Washington, and Oregon, which has only just begun, that an estimate cannot be very close, this being the first spring that the road has been open through.

The New York Railroad Commission has submitted a special report on the question of *pro rata* freight charges, which had been submitted to it by the state Senate. There is probably no other civilized country in the world where such a proposition would receive serious consideration at this time. It comes up early in all countries, but it usually goes down early too, as very slight consideration shows that *pro rata* rates would be of great disadvantage to all parties concerned. The New York Commission, like nearly every one of the hundreds of other investigating bodies that have examined the question, finds that such rates are entirely impracticable. The Commission included special rates and regulation by law in its investigation. It discovers so many necessary discriminations in rates that it finds difficulty in establishing any general rule which will prohibit what is desirable to prevent without also preventing much that the public interest demands; but it ventures to recommend the prohibition of contracts which require the shipper to ship all his freight by rail and none by canal as a condition of a reduced rate; and it would make it *prima facie* evidence of discrimination if the rate from a terminus to an intermediate point is higher than the rate from the same terminus to a more distant intermediate point—which is a modification of the Massachusetts short-haul law, and has no sufficient justification; for the competition which makes necessary a rate yielding less than the average profit may exist at an intermediate point as well as at a terminus, and unless a road earns very large profits there is no justice in requiring it either to give up its small profit on part of its business or to reduce its fair profits on the rest of it; for that is what a "short-haul" rule means.

The conclusions of this report were foreshadowed in a report recently made on complaints as to rates on the Utica & Black River Railroad, which report was generally a very reasonable document.

Judge Van Brunt, of the New York Court of Common Pleas, has decided that the modification of the lease of the Metropolitan Elevated Railroad to the Manhattan Company by the directors, without submitting it to a vote of the stockholders, by whom the original lease was confirmed, was illegal. The directors had no authority to make a lease, he says, and a change in the rental to be received from 10 to 6 per cent. was essentially making a new lease. Further

the decision says that the agreement then made between the board of the Metropolitan and that of the Manhattan Company was voidable because three of the Metropolitan directors were also Manhattan directors, which made it a case of directors contracting with themselves, as in the case of the original contract between the Atlantic & Great Western and the United States Rolling Stock Company, on which we made comment some years ago. But the Judge finds that there was no fraud in the case, but that the agreements were actually for the best interests of the Metropolitan Company. The whole financing of the elevated companies has been such as to lead the public easily to believe evil of every step taken; but the frauds have been chiefly on the investing public by leading it to expect something very different from the facts. When the roads were opened enormous earnings and very light working expenses were shown, and the public was led to believe that 10 per cent. dividends and a considerable surplus over were all but certain. Meanwhile more capital was going into an additional road that even then seemed sure not to earn interest on its cost. Then, in 1879, the lease was made to the Manhattan Company, a corporation without any property, which "guaranteed" 10 per cent. dividends on the stocks of the two old companies. So confident were people that this company would earn more than enough to pay these dividends that both the stocks sold well above par, and even Manhattan stock, whose dividends must come out of the surplus after paying 10 per cent. on the other stocks, touched 72. But in course of time it became evident to outsiders as well as insiders that the maintenance expenses of the elevated railroads would be a formidable sum, that the costly Second avenue line could not do much more than earn its expenses, and that the total net earnings would not suffice to pay the guaranteed dividends. The deficit was chiefly on the lines of the Metropolitan Company, which owns the Second avenue line. The Manhattan Company failed to pay the dividend due July 1, 1881, and went into receivers' hands. The next fall the modification of the lease just adjudicated was made, according to which New York Elevated stock was to be exchanged for first preferred and Metropolitan stock for second preferred Manhattan 6 per cent. stock. The Metropolitan shareholders did not accept the agreement which their directors had made for them, and elected a new board at the next election.

It was inevitable that the terms of the original lease of the Metropolitan to the Manhattan should not be executed, because the earnings did not suffice to pay the dividends, and the Manhattan had no other resources. It then was optional with the Metropolitan Company to resume the operation of its road or to accept a rental which the Manhattan could pay. But it was the privilege of the Metropolitan *Company* to decide this matter, while their directors assumed to decide it for them without consulting them. It is gratifying to know that directors have no such power unless it is expressly granted them.

The elevated roads can be best worked by a single management, and it is quite possible that the lease as modified is fair to the Metropolitan stockholders. They should have the right to decide whether they will accept it, however.

The effect of the decision on the stock market the day it was announced was an advance of Metropolitan from 102 to 105, and a fall of Manhattan from 43⅛ to 42½; but the next day Metropolitan fell back to 103, so the judgment of the stock market seems to be that the value of the property has not been improved by the decision, from which an appeal will be taken.

The New York Legislature has recently had two bills before it to provide New York with city railroads, which illustrate the straits to which the community is put for lack of either a legislative body or an administration in whose honesty and judgment it can trust. Formerly street and other railroads were chartered by special acts, but the opportunities for jobbery were so great, and the character of legislatures was so low, that when a new constitution was made special legislation was prohibited, and the Legislature was required to pass general laws providing for charters for such enterprises. Now, to frame a general law for a railroad charter, and especially for a city railroad charter, is about like making a "general plan" by which all houses shall be built in the future. The exercise of judgment by somebody representing the community is needed at almost every step, and decidedly so in determining whether a street railroad shall be built at all, what particular route it shall follow, what restrictions shall be placed on the company working it as to fares to be charged, the number and time of trips, the use of its tracks by other companies, the motors to be used, etc. A general law which should give charters, subject to the determination of these requirements by some competent authority acting in behalf of the community, might fit all cases; but alas! the "competent authority" is lacking. Naturally those best fitted to say whether, whence or how a railroad should be built in the streets of New York are the men who represent the real interests of the people of New York, whom we ought to be sure to find somewhere in the city government. But the property-owners of New York would probably trust the determination of such matters to almost any other body rather than to any branch of their city government.

As a special charter can no longer be granted, laws are planned which are general in their terms, but which substantially apply only to one set of men or circumstances. A project to establish cable railroads in the city—apparently an entirely feasible and a promising scheme—was so managed that, if successful, it would have given to one corporation the sole right to build railroads in pretty much all the streets where it can be worth the while to build them for a long time to come. On the heels of this comes a general street railroad law, which, as we have said, must inevitably work badly in some circumstances, and can hardly work really well in any; but even this was tortured so as to give certain interests special favor.

The original bill provided that a certain proportion of the gross earnings of *every* street railroad company should be paid into the city treasury—3 or 5 per cent. Now, this is a very large part of the *net* receipts of most companies. In 1881–82 5 per cent. of the aggregate gross earnings of all the street railroads in the state of New York was 20 per cent. of their net earnings and more than one-third of the whole amount of dividends paid. Any *general* requirement of the kind will inevitably prevent the building of such roads in many places where they are needed, and where they would pay if not exposed to such an exaction. There are, of course, some roads whose expenses are more than 75 per cent. of their earnings, and on which, consequently, 5 per cent. of the gross earnings would be more than 20 per cent. of the net. In 1881–82 one Brooklyn road earned $105,138 gross and but $6,126 net; 5 per cent. of its gross earnings would have taken $5,257 of its net earnings, and would have left but $869 to pay interest on its cost ($408,500). Two street railroads in the state had *no* net earnings, and on no less than 11 more the expenses were more than 80 per cent. of the earnings, so that 5 per cent. of their gross earnings was more than 25 per cent. of their net earnings.

Some street railroads make enormous profits, but that is no reason why all street railroads should pay a special tax.

The Decreasing Grain Exports.

The breadstuffs exports of the United States last March, reported by the Bureau of Statistics, are very unfavorable, even compared with an unfavorable year. For four years the March exports have been:

	1881.	1882.	1883.	1884.
Flour, bbls.....	679,111	499,326	810,405	664,998
Wheat, bush.....	11,624,653	6,292,343	6,158,652	4,250,385
Corn, bush.....	8,852,675	2,586,726	8,193,829	3,485,669
Other grain.....	226,310	147,683	144,958	415,169
Flour and grain, bu	23,759,637	11,273,719	18,144,261	11,143,514
Value.....	$22,301,161	$12,414,906	$17,841,882	$10,458,466

Thus the exports this year were even a little less than in 1882, after the poorest grain crops we have had for many years, and were 38½ per cent. less than last year, and not half as great as in 1881. The value of the exports is also less this year than in any of the others, and 16 per cent. less than in 1882 even. The flour exports were larger than in 1882, and larger than in any year previous to 1881; but the wheat exports were the smallest since 1877, and with the exception of 1882 the corn exports were the smallest that have been made in any March since 1875.

For the three months ending with March the breadstuffs imports are almost equally unfavorable, the values for four years having been:

1881.	1882.	1883.	1884.
$51,149,613	$35,567,623	$49,450,469	$32,827,514

Thus the value of the exports for the three months this year was one-third less than last year, 8 per cent. less than in 1882, and 36 per cent. less than in 1881.

It was not till 1878 that there was a great and general increase in our grain exports, which culminated in 1881 for wheat and in 1880 for corn, since which time the decrease has been startling. We give below the exports of flour, wheat and corn in the first quarter of the year for 11 successive years:

Year.	Flour, bbls.	Wheat, bu.	Corn, bu.	Total, bu.
1873.....	539,952	6,721,304	6,297,532	15,448,620
1874.....	1,043,163	11,928,348	5,634,936	22,257,917
1875.....	954,778	8,865,847	7,148,054	20,310,402
1876.....	892,830	8,200,428	15,168,401	27,386,564
1877.....	695,545	6,211,747	17,707,390	27,045,089
1878.....	1,078,537	16,378,153	21,323,505	42,555,044
1879.....	1,464,276	20,883,151	18,222,385	45,694,778
1880.....	1,250,957	20,112,058	24,636,722	50,378,086
1881.....	1,983,351	27,495,225	15,991,952	52,412,256
1882.....	1,508,556	18,383,037	6,664,571	34,837,110
1883.....	2,648,529	18,829,983	17,669,264	48,417,627
1884.....	2,139,044	13,269,107	9,133,869	32,028,674

The wheat and flour exports together, which were 9,300,000 bushels in 1877, jumped suddenly to 21,200,000 in 1878, and to 36,400,000 in 1881, but fell this year 22,900,000, or nearly to the level of 1878. The corn exports nearly doubled from 1875 to 1876, and have not since fallen below the level of 1876, except in 1882, after a crop 520 millions of bushels below that of the previous year, and in this year, when they are but little more than half as great as last year. In the aggregate the exports were less this year than in any other since 1877, one-third less than last year, nearly 40 per cent. less than the maximum in 1881, and 25 per cent. less than in 1878.

This very great decrease in our principal export has a considerable effect on the present economical condition of the country.

The engravings of old designs for trestle-work and rails shown in our last issue in connection with Mr. Watkin's paper on "The Semi-Centennial of the Pennsylvania Railroad" should have had an annotation with them that they were not all from the early practice of that one road. Figs. 1, 2 and 3 were early designs for trestles on the works of the Delaware & Hudson Canal Co., and fig. 4 was a similar design for the South Carolina Railroad. Figs. 6, 7 and 8 and rail-sections 1, 2 and 7 only are from Pennsylvania Railroad practice. By a singular coincidence the engravings referred to which are not from Pennsylvania practice will serve as illustration to references in Mr. Horatio Allen's reminiscences which we have just published.

The Chicago *Tribune* has gathered opinions from a large proportion of the counties in the spring-wheat-growing states of the upper Mississippi valley, as to the effect of the present low price on the acreage to be seeded this spring. In almost every case the reply is that it will have no effect. In many parts of Southern Minnesota and most of Iowa the wheat acreage has been reduced yearly for several years. In some of these the reduction will continue this year, but in not a few it will be prevented by the favorable returns *to the farmers* of last year's crop. This was the best for some years, and most of it was marketed at good prices, and these farmers had not had such a profitable wheat crop for some years. Most of them have known prices quite as low as they are now, and have known them to go up between seed time and threshing as well as to go down. Consequently, it seems probable that the reduction in area in that part of the country which has been abandoning its production will be *less* this year than last. In Northwestern Minnesota and Dakota wheat is and must be the chief crop, and there will be an increase in the area sown probably quite in proportion to the large increase of land under cultivation. There the only other important crop is oats, and it is much easier to overstock the market with that than with wheat, as oats are not exported. In Nebraska, where both wheat and corn yield well, the tendency in the older parts is to plant more corn and sow less wheat, but the acreage under cultivation has increased so much that probably more wheat will be sown this year than last. In Wisconsin, the only other spring wheat growing state of that section, the acreage is reported little changed. Altogether, there can be little doubt that, taking the district as a whole, the acreage sown will be larger than last year, chiefly on account of a great increase of acreage under cultivation in Dakota.

The only other important spring wheat district is in Eastern Oregon and Washington, from which no information has been received. It has been growing rapidly, and it produces scarcely any other crop than wheat.

However, all the exclusively spring-wheat country together produces scarcely as much as one of two older winter-wheat states, and an increase of 25 or even 50 per cent. in its production would hardly be felt at all in the world's markets.

The through and local shipments of flour, grain and provisions eastward from Chicago for the week ending April 12 by the incomplete report to the Board of Trade were 97,653 tons, against 32,484 tons in the corresponding week of last year and 90,753 tons in the previous week of this year—the largest shipments ever made in a single week. Of the shipments last week 15,025 tons were flour, 76,407 grain, and 6,221 provisions. Compared with the previous week there was a slight decrease in flour, an increase of 1,979 tons in provisions, and an increase of 5,614 tons in grain. The provision shipments were a sixth less than in the corresponding week of last year, the flour shipments more than three times as great, the grain shipments nearly four times as great. Last week the Fort Wayne led in the amount of shipments, which is its proper place, but which it had not done for a long time. It carried 18.9 per cent. of the whole, which is not quite its share; but the other Pennsylvania road carried 13 per cent. of the whole, which is much more than its share. Next to the Fort Wayne comes the Chicago & Atlantic, with 14.7 per cent., and the Baltimore & Ohio carried 12.5 per cent. The three Vanderbilt roads together carried 30.9 per cent., the Nickel Plate leading with 11.4, followed by the Lake Shore with 10.2, and the Michigan Central with 9.3. The Chicago & Grand Trunk was lowest next to the Michigan Central, carrying 10 per cent. of the whole. But the local shipments, which are not pooled, are included in this report, and those roads which have comparatively a small traffic in grain and flour to points east of Toronto, Buffalo and Pittsburgh, such as the Chicago & Grand Trunk, the Nickel Plate, the Baltimore & Ohio and the Chicago & Atlantic, probably had considerably larger percentages of the through shipments than those reported above.

It is a remarkable fact that now when shipments are

largest the newer roads, all single-track lines, and generally counted not able to carry as much as the older ones, are actually carrying as much as any. Actually there can be no doubt that the roads, if all should do their utmost, could carry much more than the largest amount yet shipped. Probably if they should do so long the cars would accumulate in the East to such an extent that they would not be furnished fast enough to keep up the shipments; but there would be plenty of room on the roads for it.

At the rate of through shipments for the past two weeks about 4,400,000 tons would be forwarded from Chicago in a year, while the largest shipments in any year heretofore has been 2,890,000 tons.

A trustworthy correspondent gives, in a letter published on another page, definite statistics of the numbers of car wheels cracked or broken on the Pennsylvania Railroad for the last three years—a larger body of such statistics than has been published heretofore. The result is very much more favorable than some statistics for shorter periods, on which we have commented heretofore. Out of an average of 423,472 wheels on the road, the number cracked was at the rate of 2.368 per year (0.55 per cent.), and the number broken 447 (0.105 per cent.), or 0.655 per cent. in all. The statistics are the more valuable because they cover such a large number of wheels and so long a period, though when we have them for a still longer period they will be still more valuable.

In the same letter is given a table showing the number of wheels under locomotives and passenger cars removed, and the chief defects causing removal, of those cast at the Pennsylvania Railroad's wheel foundry in Altoona, and their size and the kind of service in which they were used. Out of 20,306 of those taken out in 1883, only 230 (1.1 per cent.) are reported cracked or broken, while 4,210 were good for refitting, and no less than 8,141 had worn flat by sliding.

The fractures were very largely under engines, only 30 per cent. having been under passenger cars, though probably two-thirds of the wheels reported on were under passenger cars, so that a wheel under an engine seems 4⅔ times as likely to be cracked or broken as one under a passenger car.

An average mileage of the wheels removed from Pullman passenger cars was very nearly 70,000, under ordinary passenger cars, 52,000; the largest average mileage under locomotives was 49,212, by 30 in. wheels under freight engines; the shortest was 35,586, by 28 in. wheels under passenger locomotives.

Experimental tests of iron ties of approved German patterns will be made this year on the Philadelphia & Reading Railroad. The cost of such ties in this country is still great, and it is hardly to be expected that the movement will soon become general, but it is not impossible that our railroads will be eventually driven to their use, and there has heretofore been some discussion of their availability on parts of the Southern Pacific which are very distant from any timber. In Germany they are in very wide and increasing use, but in England, for some reason, their introduction has not met with so great favor, though iron is cheaper there and wood probably dearer. It is not always remembered, in comparing the life of wooden ties in England and the United States, that the constantly moist climate and absence of our fierce summer heats there places a wooden tie under more favorable conditions for long life, independent of better drainage, which is another undoubted advantage over average conditions in the United States. As the iron supports cost much more than the wooden ties, and last much longer, the change would be equivalent to an improvement of the road, and the excess of cost over that of the ties renewed would be properly chargeable to capital, as in the case of a wooden bridge replaced by an iron or stone one.

Many contradictory reports have been circulated respecting the performance af the compound locomotive which is having a trial on the Boston & Albany Railroad. We are informed on excellent authority that the engine works well, but is not making the saving in fuel which had been anticipated. The engine is in regular service, running every day. Mr. Dunbar, the patentee of this method of arranging the compound cylinders on a locomotive, is at present in South America, but on his return he may be able to suggest some improvements which will secure greater economy. Mr. Dunbar is a practical man, having had considerable experience with locomotives, and is well known in connection with the packing that bears his name. Compound engines have been singularly successful on board ship, and therefore their possible development on locomotives is at once an interesting and important problem.

There is talk of a consolidation of the Lake Erie & Western, the Central Iowa and the Peoria, Decatur & Evansville companies, all weak companies with a comparatively short mileage, and with no terminus at a market of the first importance. The two former would make a tolerably symmetrical system; but the Peoria, Decatur & Evansville, extending southeastward from Peoria, is hardly in position to make a good feeder for an east-and-west line like the Lake Erie & Western. The last-named road extends from Lake Erie at Sandusky southwestward 176 miles to Muncie, Ind., and thence nearly due west 202 miles to Bloomington, Ill., with a branch 9 miles long. At its western terminus it is 46 miles from the eastern terminus of the Central Iowa and the northwestern terminus of the Peoria, Decatur & Evansville, at Peoria. The Central Iowa extends from Peoria westward 188 miles to Oskaloosa, Iowa, crossing the Mississippi at Keithsburg, and from Albia, 26 miles south of Oskaloosa, nearly due north 180 miles to Manley Junction, near the Minnesota line, together with 126 miles of branches in Iowa. The road from Oskaloosa to Peoria is new. It was originally expected that the Central Iowa would form a link in a great trunk line between St. Paul and St. Louis, but the north-and-south traffic never became very important, and most of it goes to other lines. Thus the line to Peoria was built at right angles to the old north-and-south line.

The Peoria, Decatur & Evansville is 254 miles long from Peoria southeast to the Ohio line at Evansville, Ind. It was completed to Evansville only a few years ago, but the northwestern part was the Pekin, Lincoln & Decatur, which was one of the wrecks after 1873, as were, indeed, parts of all three of these roads.

The gross and net earnings, total and per mile, of each of these for the last year reported (1882 for the Central Iowa, 1883 for the Peoria road, and the year ending with June, 1883, for the Lake Erie & Western) have been:

	L. E. & W.	Cen. Iowa.	P., D. & Ev.
Total:			
Gross	$1,503,523	$1,209,100	$721,255
Net	199,134	533,233	297,175
Per mile:			
Gross	3,895	3,863	2,840
Net	516	1,704	1,170

For 1883 the gross earnings of the Central Iowa were $1,307,103, or $3,601 per mile. The Lake Erie & Western has not yet reported.

These are extremely light earnings, and but for light funded debts the companies would have been bankrupt before this. The Lake Erie & Western, when reorganized, was described as a through line something like the Lake Shore, and it was hoped that it would secure a large part of the traffic which the Lake Shore interchanged with the Wabash. It has, however, no connections in the West which are particularly interested in bringing it traffic, and there is no important traffic centre on its line; and it gets very little through traffic, as its earnings show; for it passes through a fine and well peopled farming country. A consolidation with the Central Iowa would secure it what that road has to ship through to the East, which is probably not a very large amount; but the Evansville road could hardly interchange much with it; and to reach either some 45 miles of new road must be built.

Record of New Railroad Construction.

This number of the *Railroad Gazette* contains information of the laying of track on new railroads as follows:

Cincinnati, Van Wert & Michigan.—Extended from Greenville, O., southward 2 miles.

Florida Railway & Navigation Co.—A branch is completed from the *Peninsular Division* at Wildwood, Fla., east to Leesburg, 12 miles.

Oregon Pacific.—Track laid from Yaquina, Or., southeast to Oneatta, 6 miles.

Pennsylvania.—Track is laid on the new *Pennsylvania Schuylkill Valley Branch* from Fifty-second street in Philadelphia northwest 3 miles; also from Spring Mill to Norristown, 6 miles.

This is a total of 29 miles of new railroad, making 466 miles reported to date for 1884. The total track reported laid to the corresponding date for 12 years is as follows:

	Miles.		Miles.
1884	466	1878	267
1883	911	1877	267
1882	1,772	1876	356
1881	819	1875	196
1880	996	1874	324
1879	391	1873	566

These statements include *main track only*, no account being taken of second tracks or other additional tracks or sidings.

NEW PUBLICATIONS.

The Control of Defective Sight, with Especial Reference to Color Blindness. Chicago: Willard A. Smith. 1883.

Those who wish a résumé in small compass of what has been done on this subject at home and abroad can find it in this pamphlet, and it is an important subject for railroad officers to investigate, since the general result of tests among railroad employés is to show that from 3 to 6 per cent. have grave defects of eyesight which are liable to cause accident. A more complete treatise on the subject from its scientific and medical side, we may add, is Dr. Jeffreys' "Color Blindness," published some years ago by Fields, Osgood & Co.

The Coal Trade. By Frederick E. Saward. Published by the *Coal Trade Journal*, New York.

This is the eleventh yearly edition of a manual of statistics, prepared by Mr. Frederick E. Saward, Editor of the *Coal Trade Journal*, and it gives in condensed form a summary of the information about the output, shipments and prices of coal which is published in the *Journal* throughout the year. A large part of the book is devoted to the anthracite trade, not only on account of its importance, but also because it is almost the only part of the coal trade of the United States concerning which it is possible to secure correct and definite statements. It is, unfortunately, a fact that accurate figures for bituminous coal production can be obtained only for the Cumberland Region, for the districts served by the Pennsylvania Railroad and for a few other small districts in Pennsylvania. Outside of these our information is only approximate, and the amount of this important traffic can only be guessed at. Mr. Saward has, however, collected in his book a great mass of valuable information, and has put it in a form to which reference can easily be made. There will be found in it tables giving the production and distribution of anthracite coal for a series of years, and similar informatio for all the bituminous regions for which figures are accessible. The book is of convenient size for the desk, and must be almost indispensable for all who are interested in the coal trade, especially as it is the only manual of its kind now published.

The Reading Railroad Shops.

The Philadelphia & Reading Railroad is materially enlarging both its locomotive and car shops at Reading, the increasing extent of this line having rendered the accommodation given by the old shops insufficient. The locomotive shops were built many years ago, when the traffic and extent of the line were far smaller than at present; and though the ground then taken was deemed ample for all future requirements it now affords little scope for enlarged or additional shops. The town, too, has grown, and now surrounds the shops on all sides. As the available area is so small the new shops are chiefly two or three-story buildings, served by hydraulic elevators, and additional shop room has been thus obtained without interfering with surrounding private property.

The old blacksmith's shop, a temporary structure, has been pulled down and superseded by a roomy brick building, situated on a lower level on the other side of the line. It adjoins the forge, where a considerable number of wrought-iron axles are made, and where an old helve hammer is still doing good service. The new blacksmith's shop has 40 fires, a couple of furnaces, three small steam hammers, a spring-power hammer, punching and shearing machine, screwing machine and a Sadler's patent machine for welding new ends on to old flues. The tube and new end are heated and slipped on to the end of a revolving mandrel, and another revolving roll being brought to bear on the outside of the tube, the weld is effected without a blow being struck, and entirely by rolling, leaving the tube when finished perfectly smooth and circular. The ends of the rolls are within a few inches of the fire, and consequently the whole operation is very quickly and conveniently performed, the rolls being driven by power. The iron for the smith's use is stowed in bins arranged underneath a trestle carrying a siding, and a hydraulic lift at the end of another siding enables hand cars to be transferred from the level of the smith's shop or forge to rail level. The floor of the elevator can, however, rise above rail level, so that its contents can readily be transferred to the floor of a flat or gondola car.

The site of the old blacksmith's shop will be occupied by a large boiler shop, the main part of which will be spanned by an overhead-power traveling crane. The remaining part of the building will be on three floors, the two upper stories being used for tank and sheet-iron work respectively. Parallel with the boiler shop is another three-story brick building, the ground floor of which is to be used as a frame shop, with patternmakers, locomotive carpenters and painters on the floor above. Locomotive cabs, etc., can then be made and finished there, and taken across the street to the erecting shop. The top floor will serve as a store for patterns and small locomotive supplies. The underground basement will contain sand for the adjacent foundry, and all the engines required for running the machinery, the electric light, hydraulic cranes and lifts, etc.

When these additions are completed much of the work now done in the erecting shop can be transferred to the new shops, and some of the heavy machines for frames and cylinders can also be shifted, giving more room in the erecting shop. The latter is a large building arranged with three longitudinal bays supported on light iron columns, the outside walls being of brick. Nearly the whole of the centre bay is taken up by a traverser, from which the engines are transferred right and left to stalls in the side bays. A large amount of room is thus lost, but with the limited space available, the traverser cannot be put outside the building, and as the walls and pillars are not strong enough to support traveling cranes it is difficult to see how the shop could be improved except by entire reconstruction.

The erecting shop contains a large number of machine tools, and a remarkably neat and well appointed enclosed store and repair shop for tools and gauges. The United States standard threads have just been adopted, and a large number of gauges or fixed calipers for various dimensions, and for various parts of engines are used, insuring accuracy and interchangeability in similar parts of different engines. Each man employed is furnished with five checks to be used exclusively for obtaining tools or gauges. When he applies for a certain tool he gives up one of these checks to the keeper of the tool store, who hangs the check up in the bin whence the tool came. This saves any entries in a book, the check showing at a glance the present possessor of the tool. Any man losing a check has to pay 25 cents. Among the tools used in repairing the gauges, etc., is a neat little grinding machine made at the works. The carriage carrying the revolving emery disk moves on the lathe bed, the work to be dressed being held between the centres. The carriage can be given either a sliding or traversing motion, reversing automatically at the end of each stroke.

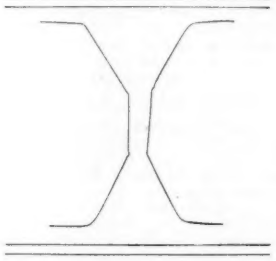
The headlight reflectors are burnished by a useful little automatic machine. The reflector is held in a suitable chuck and slowly revolved about its axis. The burnishing tool is carried by a bar which has a reciprocating motion between the edge and centre of the reflector. The path of the burnisher is made to conform to the parabolic curve of the reflector by a spring, which maintains a practically even pressure on the burnisher as it moves on the reflector.

Some fine tools for finishing cylinders are grouped around a jib crane. The cylinder and half-saddle form an unusually large casting, owing to the great height of the boiler above the wheels. Each cylinder is bored and faced in eight hours on one of Sellers' machines for that purpose,

both ends of the cylinder being faced at once. The valve faces and ports are then planed on a special shaping machine, also of Sellers' make. The cylinder is centered by conical chucks between two vertical face-plates secured to a horizontal circular table. A shaping-machine arm, with a very long bearing in proportion to its stroke, works at a suitable distance above the table, so as conveniently to reach and plane the valve faces. The table is accurately quartered, and when the valve seat has been planed longitudinally the table is turned a quarter round and the cross planing proceeded with. The machine completes its work on a cylinder in about nine hours, the rest of the planing being done on a large planing machine of the ordinary type, two cylinders being secured on the bed by special chucks and angle plates.

In addition to ordinary repairs these shops have been building standard passenger engines at the rate of three per month. These engines are similar to that exhibited at Chicago, except that the wheels are smaller, 60 in. instead of 68 in. diameter on tread, the latter size being used for express engines, and the former for engines working accommodation trains. The cylinders are 18 in. × 22 in., and the weight of the engine when ready for the road is about 90,000 lbs. The tubes are only 1½ in. diameter, and Allen Richardson balanced slide valves are used. The engine exhibited at Chicago is now in for repairs, and shows little signs of wear. Bushed ends are now generally used for all classes of engines, except those for express service, which have octagonal brasses in two halves, with a key for taking up wear. Steel driving and truck axles are also now used for all classes. For some years steel axles were only used on wheels over 48 in. diameter. No steel axle used on the line has yet proved defective, which is, of course, a strong argument in favor of their general adoption.

The tenders under construction for the engines above mentioned hold 3,000 gallons, and have iron trucks and frame. The latter is mainly composed of four long channel bars, each 6 in. × 2¼ in. These form the longitudinals or sills, the inner bars being perfectly straight, and the outer bars bent to an easy radius at the corners of the tender so as to form the end sills, the joint being made on the centre line of the tender immediately above the draw gear. The outer longitudinal and half of each end sill are thus formed of solid channel-iron bar. The inner and outer sills are braced together by three sets of vertical flat bars placed thus.



The two middle sills have no diagonal bracing between them, but are, of course, held together by the double body bolsters, which are also formed of the same section channel-iron. The frame is covered with a platform of hard-wood planking, on which the tank rests.

The car shops are situated north of the town, and therefore at some distance from the locomotive shops. The main shop was built some years ago on the same general plan as the locomotive erecting shop, in three bays, with a traverser running up the centre bay. This arrangement will probably be altered, and the traverser placed outside the building, when the centre bay will become available for erecting cars. A new blacksmith's shop has been built alongside the car shop, and will probably be extended to form a machine shop. A three-story brick building, which will serve as an upholstery and car store, is nearly finished to the north of the main car shop. When these extensions are completed the main shop can be wholly devoted to erecting and repairing freight and passenger cars. Until recently the shops have been turning out 72 freight cars per week, but the order is now completed and no new freight cars are under construction, though a large number are being repaired, and new passenger cars are being turned out at the rate of six per month. The bodies of these cars have round corners and are finished internally with cherry. The carlines are compound, a stiff iron bar being placed between two pieces of cherry which are partly cut away in graceful curve to show the polished surface of the iron underneath, producing a very pleasing effect and taking off the heavy look generally produced by a carline running across the clear story without following its outline. The saloon is fitted with a neat washstand, an addition to the accommodation usually provided. The cars have both gas burners and suitable holders for candles, the latter being used should the car be detained at some remote station where gas cannot be obtained.

As is well known, the Philadelphia & Reading Company has for many years used gas made from naphtha for illuminating its passenger coaches, and, to some extent, its station and offices at Reading. The gas is made in three sets of small retorts, whence it passes through a tank of water, which in cooling the gas condenses some of its tarry impurities. The gas then passes into a large cylindrical vessel containing several perforated plates, the surface of which retains any remaining solid or tarry matter. No lime or other chemicals are found necessary to purify the gas, which differs essentially from coal gas, possessing a far higher illuminating power, which is, moreover, unaffected by storage or compression; whereas coal gas under either of these circumstances often separates into a liquid hydro-carbon, and a gas which has practically no illuminating power. The oil gas made at Reading is compressed to a pressure of 325 lbs. per square inch, and is then charged into stout welded wrought-iron reservoirs, which resemble the auxiliary reservoirs used for the Westinghouse brake. The reservoirs are carried under the cars, and a reducing valve placed between the reservoir and burner diminishes the pressure of the latter to an ordinary gas pressure, an inch or two of water. When used for lighting the station and offices the gas is not compressed, and some air is mixed with it in order to reduce slightly its illuminating power. The maximum production of these works is about 1,000,000 cubic feet per month; and having regard to its superior illuminating power, this output is equal to 2,500,000 cubic feet of coal gas. The regular staff consists of three men, two on duty at night and one during the day, while two other men are in readiness for an emergency, repairs, cleaning out condenser, etc. The small extent of the plant and its neatness and cleanliness impress a visitor very favorably as to the economy of this method of lighting cars, while the light appears to be steady and sufficiently brilliant, without producing the smoke, smell and broken glasses of the ordinary car lamp.

The holes in the arch bars of the iron trucks of tender and freight cars are punched by a machine with an adjustable automatic feed. The bar is cut to length, the end placed against a stop, and the first hole punched; the machine then automatically feeds the bar forward the proper distance for the next hole, and so on. This is, of course, done when the bar is straight, and it is afterward bent when hot on a former.

While iron frames are used for tenders the eight-wheel coal cars are now made of timber, though formerly iron cars were extensively used on the line, and many are still running. It is stated that iron cars are more difficult to repair after a collision. The question of wood *versus* iron is one that cannot be settled offhand; many contingent factors have to be taken into account, and it must not be forgotten that so few iron cars have been built that but little experience has been gained as to the modes of construction likely to prove most satisfactory in the long run, while the constructer of wooden cars has the benefit of an accumulated experience, and knows beforehand how to guard against weak points. The eight-wheel coal cars hold 50,000 lbs., and have hopper bottoms and sloping ends, so as to discharge rapidly and without any manual labor.

State Railroad Management in Pennsylvania in 1836.

The following are extracts from the report of a committee of the Pennsylvania Legislature which was appointed "to examine the present state of motive power on the Philadelphia & Columbia Railroad," and which rendered its report June 6, 1836, referred to in Mr. J. E. Watkins' paper on the Semi-Centennial of the Pennsylvania Railroad last week.

"The number of locomotive engines belonging to the Commonwealth. Philadelphia & Columbia Railroad is 17. The committee find that much dissatisfaction exists in regard to the inefficiency of the motive power under its present management, and that it is, and has been for several months, passably insufficient for the required transportation —we have it in evidence, and that too from one of the officers employed by the state on the road, that in the month of December of the 17 locomotive engines the average number actually running was but three or four.

"It has been satisfactorily proven to the committee that loaded cars have frequently stood waiting for conveyance for several weeks, to the great detriment and loss of the owners of the merchandise and produce. * * The delays from want of engines were so vexatious that many transportation companies were compelled to use horses, at times, to get their goods over the roads. * *

"In relation to the occasional use of horse-power on the roads, the committee discovered many different opinions were entertained. The many disappointments and vexatious delays which the transporters suffered during the past season have induced them to advocate strongly the use of horse-power. They have been compelled to resort to the use of it in order to prevent their produce from standing for weeks in loaded cars, which the engines were daily passing, and the engineers unable or unwilling to transport. It is believed that they would be satisfied if they could be served at all times by steam-power, but it is very desirable that some plan should be adopted by which the occasional use of horse-power could be so regulated as to be both safe and useful. There is also little doubt that the locomotives are very frequently injured by the carelessness and incompetency of the engineers managing them. The want of a proper system of direction and the necessity of reform as regards the regulation of this branch of the subject is very apparent.

"From the time the engine leaves the depot and while running the entire route the engineer is under no control whatever and is under no responsibility as to his conduct or the management of the engine. His speed is regulated by his own will; the time of his stopping and starting appear to be according to his own convenience or caprice; he takes on his train just such way cars as he chooses, and rejects those which he does not wish to take; and the farmer and the miller, whose produce has been lying in the cars for days or even for weeks, waiting for a chance for conveyance to the market, has no redress. His complaints are unheeded when the locomotive passes by, and his cars must stand on the siding until some engineer is sufficiently obliging to attach them to his train.

"It is believed that great necessity exists for a proper regulation of the speed of locomotives, and that if such a system could be brought into effective operation as would in some measure equalize their velocity and prevent immoderate running down grades and around curves, a material saving in the wear of both engine and road would be the consequence. The committee, in the course of their investigation of the branch of the subject, have had under examination many persons possessed of science and intelligence, and have found them universally to agree in the opinion that the speed of the engines drawing passenger cars should be so regulated as not to exceed 15 miles per hour, and that those with burthen cars should be limited to 10. If a careful and responsible individual could be sent with every train as state agent, whose duty it would be to control and regulate the speed, and with whom should rest the general direction of every part of the business except the mere management of the engine itself, a saving to the state would result, particularly if it be true, as is asserted, that incorrect returns are made of the passengers conveyed on the road. It seems that no register of way passengers is kept, and by that mode of making out the returns the commonwealth does not receive the amount of toll from them to which she is entitled. This matter could be easily and fairly regulated by the traveling agent of the state on each train. The committee are also of the opinion that the locomotive engines would be kept in much better repair and much less frequently injured if the present mode of paying the engineers by the day should be changed for that of paying them by the trip or by the number of miles run in a week.

"At present it is a matter of indifference with the engineer whether his locomotive is in order or disabled. He receives his daily pay. Indeed, it might occur that a locomotive would be designedly broken by one whose inclination should lead him to prefer a period of rest and leisure consequent upon an accident to the more arduous task of performing duty on the road. It is believed that much better care would be taken of the engines generally if the engineers were paid only for the actual service performed by them. * * *

"With regard to the number of locomotive engines which will be required to accommodate the anticipated amount of trade for the coming season the committee estimate from data in their possession that not less than eight engines, leaving each end of the road daily with the burthen cars, and one with passengers, will be sufficient. This will require 18 locomotives to be kept constantly in effective service, and admitting one third of the whole number to be under repairs the requisite total will be 27. The Commonwealth now own 17, four of which engines are of English manufacture, on which little reliance can be placed."

High Speed Locomotives.

An article under this head in *The Engineer* discusses in much detail the possibility of running a locomotive 120 miles in two hours, running time, with an intermediate stop of 5 minutes. After pointing out at some length that the horse-power required increased faster than the speed, which would seem self evident, the article says:

"It seems, rightly or wrongly, to be accepted by locomotive superintendents that the resistance at 60 miles an hour is 40 lbs. per ton on a dead level. There is reason to believe that this is an erroneous estimate. For a gross load of 300 tons we should have $\frac{300 \times 40 \times 5{,}280 \times 60}{33{,}000 \times 60} = 1{,}920$ horse-power. But nearly 60 miles an hour has been attained with not much more than half this horse-power down an incline, reducing the resistance by a little over 8 lbs. a ton only; deducting this from 40 lbs. we have $\frac{300 \times 32 \times 5{,}280 \times 60}{33{,}000 \times 60}$ = 1,563 H.P. instead of 1,000; and our own experience leads us to believe that at 70 miles an hour the resistance does not exceed 40 lbs. per ton for the whole train in good weather and on a good road.

"We shall assume the weight of the engine and tender full to be 75 tons, and that of the train 100 tons, giving a gross load of 175 tons. We shall further assume that the road is in first-rate condition, that the inclines balance each other, and that the maximum gradient is 1 in 260. We shall also assume that the line at each of the three stations, for some distance, is a dead level. Under these conditions it may be taken as certain that a speed of 60 miles cannot be reached until the train has run 3 miles, and allowing 2 miles for slowing down at each stop, the full speed portion of the run must be made at 65 miles an hour to average 60 miles while in motion."

The conclusion is then drawn that to attain such an average speed, a speed of 75 miles per hour must sometimes be attained, and that "we believe an engine to run steadily and safely at that speed, must have a single pair of drivers 9 ft. in diameter. To advocate so enormous a wheel requires some courage; but we have to provide for an exceptional velocity. It is extremely doubtful if a speed of 75 miles has ever been attained save for a mile or two by any locomotive; 72 miles an hour is the highest velocity of which we have any personal experience, the velocity being checked in that case by a Stroudley speed indicator on the foot-plate and a Westinghouse recorder in the guard's van. We have traveled at 71 miles an hour on the Great Northern and nearly as fast on the Midland, but only for short distances. We are contemplating the case of an engine which may have to run 60 miles or more per day at the rate of 75 miles an hour. A 9-ft. wheel at this speed will make 229 revolutions per minute, corresponding, with a piston stroke of 2.25 ft., to 1,030 ft. of piston speed per minute, which is quite fast enough.

We may point out that the London & Northwestern engine Cornwall ran with great success for many years with 9 ft. driving wheels. Mr. Pearson used them on the Bristol & Exeter Railway, but as this line was then 7 ft. gauge, his practice will, perhaps, not be allowed to count.

The diameter of the boiler of our high-speed engine must be as large as it can possibly be. The bottom of the shell cannot safely be hung lower than 8 in. above the centre of the driving axle, bringing the middle line of the boiler about 7 ft. 5 in. above the rails. The figures are not excessive. We may go further and ask what are the objections to a high centre of gravity in a locomotive? As regards easy running, it will be found that a high centre of gravity promotes it. There is, however, more risk that springs will be broken.

The height proposed, we may note, is in no way startling, being only about 1 in. more than in the Pennsylvania fast express engine (*Railroad Gazette*, Nov. 4, 1881), and some 3 in. less than in the Wootten fast express engine (*Railroad Gazette*, Jan. 7-14, 1881), both of which are types in regular service.

The writer then goes into a long discussion of the effect o high centre of gravity in an engine, reaching a conclusion similar to that reached in a paper by F. C. Wootten, published in the *Railroad Gazette* for Jan. 14, 1881, to the effect that the riding of the engine is not injured, but improved. This results from the fact that the *inertia* of the boiler, which resists lateral motion, has to be overcome with a less favorable leverage before oscillation is produced. Consequently, the effect of minor defects in the track is more apt to be taken up in the springs without moving the boiler at all.

The horse power required is then computed, as follows:

"The resistance would not in our opinion exceed 40 per ton on a level at 70 miles an hour. But, as we have shown, the speed if the whole line was free from inclines would be but 65 miles an hour. Allowing 40 lbs. to the ton

at this speed—which is well witbin the mark—we should have a gross tractive resistance of 175 × 40 = 7,000 lbs. Now, 65 miles an hour equals 95.3 ft. per second, or 5,718 ft. per minute, and $\frac{5,720 \times 7,000}{33,000}$ = 1,213 indicated horse-power. These figures show that if we cannot reckon on getting more than 1,200 horse-power out of our boiler the weight of the train must be kept down to about 175 tons. as we have said. But our line is not level. We assume that there will be gradients of as much as 1 in 264 [20 ft. per mile] to overcome."

The conclusion is drawn, after discussion, that a decrease of speed from 65 to 60 miles per hour would probably suffice for such gradients, if not too long—which is undoubtedly true—and the question of adhesion, rails and cylinder power is then discussed, as follows:

"It will not be safe to count on a coefficient of adhesion greater than one-sixth. Thus we have 6×7,000 lbs.= 42,000 lbs.=18.75 tons as the load to be carried by the driving-wheels. This may appear a tremendous weight, but it is not too much for the 84-lbs. bullhead steel rail.

"Engines on the Bristol & Exeter line, already referred to, carried over 19 tons on their 9-ft. drivers; and we believe that single engines, with 8-ft. drivers, on the Great Northern Railway, carry quite 18.5 tons. We see, therefore, that adhesion can be had; but we also see that the weight of our train will not admit of being augmented."

"A very brief calculation will suffice to show that the cylinders of our high-speed engine must be 20 in. in diameter, with a stroke 28 in. [The cylinders of the Central Pacific 'Mastodon' type are 20×30.] An average pressure of 1 lb. in a cylinder of this size will give 103 lbs. tractive effort, and $\frac{7,000}{103}$ = 68 lbs., in round numbers, as the average effective pressure which must be maintained in the cylinders. This may be taken as standing for a boiler pressure of 150 lbs. per square inch, and we may assume an initial cylinder pressure of 140 lbs. above the atmosphere or 165 lbs. absolute. Steam of this pressure cut off at one-fifth of the stroke would give an average effective pressure of about 70 lbs. in theory, or nearly what is actually wanted in practice, and this represents a fair amount of economy. A properly designed engine running under these conditions ought not to burn more than 3 lbs. of coal per horse power per hour, or for 1,200 indicated horse-power 3,600 lbs., or for a run of 120 miles 7,200 lbs., or 60 lbs. per mile. *No doubt this will appear at first sight an enormous consumption*, but the work to be done is enormous. The advantage gained by running down inclines is as small in proportion as the loss caused by ascending them, and steam must be kept full on from start to finish. In a word, we have the case presented of an engine which has to be run as fast as it can possibly go without any regard for economy of fuel. We may add, however, that we believe that 60 lbs. per mile is in excess of the weight that would actually be needed."

The italics above are our own. That any one should speak of 60 lbs. of coal per mile run as an "enormous consumption" will strike American locomotive engineers as odd enough. The *average* consumption, of all trains, on the Pennsylvania Railroad in 1882 was as follows:

	Pounds per train-mile	
	P. R. R. Div.	P. & E. R. R. Div.
Passenger trains	54	53
Freight trains	109	170

The dimensions of the boiler are then discussed and the conclusion reached that the maximum diameter, outside, cannot exceed 51 in., and that only by suppressing the lagging "in the wake of the wheels," and that it will be impossible to get more than 1,000 sq. ft. of tube surface into such a boiler. The three leading designs for fast locomotives in this country all exceed these dimensions slightly. The article continues:

"Under these circumstances we shall have to rely on the fire-box for the production of steam to a much greater extent than usual. We have to burn 7,200 lbs. of coal in two hours, or 3,600 lbs. per hour; and even if we burn 100 lbs. per square foot per hour, we would need 36 ft. of grate to do this. But the grate cannot be more than 3 ft. 6 in. wide, and 36 ÷ 3.5 = 10.3 as its length. *Such a box could not be properly fired by any stoker*, and unless a tremendous draught were maintained by a contracted exhaust, which would entail many evils, 100 lbs. could not be burned per square foot of grate per hour. It would be necessary, we apprehend, to enlarge the fire-box on the Wootten system by spreading it behind the driving-wheels over the trailing-wheels; but this would entail the construction of a very complicated fire-box, or the placing of the wheels very far forward.

"One way out of the difficulty that suggests itself to us is the adoption of a T-shaped fire-box; an ordinary fire-box in front with about 18 square ft. of surface, and a species of addition tacked on, so to speak, about 7 ft. by 4 ft. Thus we should have a total grate surface of about 46 square ft. In order to get in sufficient tube area it would be necessary to use an oval boiler barrel. In this there is nothing novel, as such barrels have been used for years on the Continent. On such a grate the requtsite weight of coal could be consumed at the rate of about 78 lbs. per square foot per hour, which is quite feasible."

The italics above are again ours. Wherein lies the impossibility of "firing such a box" does not appear on the surface. If it be the length, the Lehigh Valley "Mastodon" type, twelve-wheeler, has a fire-box 11 ft. 6 in. long, and its standard "Consolidation" 9 ft. 10 in., or within 2 in. of the depth proposed. If it be the total quantity consumed per hour it is doubtless very large, but not more than one-quarter to one-third in excess, probably, of what is very frequently fired per hour on existing American locomotives without special difficulty. The conclusion reached therefore, that "it is not easy to see how runs of 60 miles can be accomplished in 60 minutes with locomotives of anything like ordinary type," can hardly be said to be proven, although "the discouraging fact" must be admitted "that on no railway in the world is such time made," as our author says.

An Electric Yacht.

It is currently reported that a small electric yacht or launch is to be brought to Boston from England this season, and will be seen gliding, without apparent power, over the waters of the harbor and bay. The boat is described as having a beautifully modeled hull of steel, 40 ft. long and 6 ft. beam, with seats to accommodate forty grown people comfortably—nearly double the number that a steam launch of the same dimensions would. The accumulators, eight in number, together with the motor are stowed away under the floor, fore and aft, thus serving as excellent ballast as well as being out of the way. The motor is in the after-part of the launch, directly under the helm, where it can be started, stopped or reversed, in its connection with the screw, by the steersman. The chief convenience arising from electro-motive power, as applied to the launch, is the absence of combustibles and the products thereof, heat, smell, noise, smoke-stack and stokers. Nothing is in the way from stem to stern except the stanchions which hold up the awning on either side. When the acoumulators are charged the motor is capable of working up to seven-horse power, and running the boat at the rate of about 8 or 10 miles an hour for 15 consecutive hours'—*Boston Traveller.*

TECHNICAL.

Locomotive Building.

The New York Locomotive Works, in Rome, N. Y., are building six locomotives for the Louisville, Evansville & St. Louis road.

The Manchester Locomotive Works, in Manchester, N. H., recently delivered to the New York, Providence & Boston road a passenger engine with 17 by 24-in. cylinders and 5½ ft. driving wheels, and a freight engine with 18 by 24 in. cylinders and 5 ft. wheels.

Car Notes.

The creditors of the Gill Car Co, met in Columbus, O., last week. The holders of bonds secured by mortgages, holders of claims secured by bonds as collateral and unsecured creditors being represented. A committee was appointed to investigate the condition of the company and to report the best policy for realizing on the estates.

The Suspension Car Truck Co. has bought 35 acres of land on the Western Indiana road at Fifty-fifth street in Chicago and will build shops there for the construction of its trucks and cars.

The Pullman Car Works at Pullman, Ill., have lately completed two new sleeping cars to run over the Maine Central and the Eastern roads between Boston and Bangor. The cars are 75 ft. long and are carried on two six-wheel trucks with 42-in. paper wheels.

Messrs. G. F. Anderson and A. J. Fox, of Niles, Mich., propose building car works at Calera, Ala. They also propose building a blast furnace and rolling mill at the same place.

The Charlotte, Columbia & Augusta shops in Columbia, S. C., are building several new passenger cars for the road.

The Ward Axle Brake & Coupler Co. at the annual meeting in Pittsburgh, April 8, elected the following officers: President and Treasurer, W. H. Ward; directors, W. C. Aughinbaugh, S. A. Johnson, W. H. Ward; Secretary, W. C. Aughinbaugh.

Bridge Notes.

The well-known firm of Clark, Reeves & Co. was dissolved April 7, by mutual consent. The business of the firm will be settled by David Reeves and Adolphus Bonzano, either of whom is authorized to sign the firm name in settlement. The business heretofore conducted by the firm will be continued by its successor, the Phœnix Bridge Co. The members of the new firm are Adolphus Bonzano, David Reeves, and William H. Reeves, who were all members of the old firm. Mr. Clark, of the old firm, is now a member of the Union Bridge Co. The Phœnix Bridge Co. will have its offices at Phœnixville, Pa., and No. 410 Walnut street, Philadelphia, and No. 49 William street, New York.

The Keystone Bridge Co., in Pittsburgh, has taken the contract for the superstructure of the bridge over the Susquehana River, on the Philadelphia Branch of the Baltimore & Ohio road, near Havre de Grace, Md., including the following spans: One 520 ft. through span, one 520 ft. deck span, four 480 ft. deck, two 380 ft. deck, one 380 ft. through, one 200 ft. deck. The approaches will include 2,000 ft. of iron viaduct about 70 ft. high, which will be built by the railroad company. Gen. Wm. Sooy Smith, of Chicago, has the contract for the sub-foundations, and Drake & Magaw, of New York, for the masonry.

The King Iron Bridge & Manufacturing Co. at its recent annual meeting in Cleveland, O., elected the following directors: Zenas King, Dan P. Eells, Leverett Alcott, Henry D. Sizer, Charles B. Bernard, Horace Wilkins, Thomas H. Brooks, James A. King and Harley B. Gibbs. Officers were elected as follows: Zenas King, President; James A. King, Vice-President; Harley B. Gibbs, Secretary.

Iron Notes.

The Pennsylvania Steel Works, at Steelton, Pa., have taken an order for 10,000 tons of steel rails, 76 lbs. to the yard, from the South Pennsylvania Railroad. During March the Bessemer mill of this company produced 15,390 tons of steel ingots and the rail mill turned out 11,752 tons of steel rails.

Isaac G. Johnson & Co. have recently made extensive alterations and improvements at their works in Spuyten Duyvil, N. Y. The capacity of the steel works has been more than doubled. The specialties of this firm are crank shafts, dies for striking up work, locomotive castings, and rolls for rolling mills.

Audubon Bros. & Phillips are trying the Clapp & Griffiths process for making steel at their south side mill at Pittsburgh. The new process is to be given a thorough trial.

Bellefonte & Hunnewell furnaces are the only charcoal furnaces that will run this year in the Hanging Rock region in Kentucky.

Etna Furnace at Ironton, O., will go into blast shortly.

Alice Furnace in Ironton, O., has gone out of blast and will be repaired.

Walton Furnace at Max Meadows, in Wythe County, Va., has gone into blast. It is owned by the Lobdell Car Wheel Works.

Central Furnace, in Cleveland, O., which has been idle since December last, went into blast April 1, and is now making 150 tons of iron per day.

Manufacturing Notes.

The Lidgerwood Manufacturing Co., No. 96 Liberty street, New York, have recently sold two of their improved patent friction-drum hoisting engines to the Lehigh Valley road for use on its docks at Perth Amboy, one pile-driving engine to the Philadelphia & Reading road, one to the Flint & Pere Marquette, and three to the Alabama Great Southern. This company makes a specialty of hoisting engines for railroad work.

Mr. J. Rayner informs us that the fire which occurred at his mills on Houston street, New York, on the afternoon of April 12, did not do much damage, being confined to one corner of the building by the energy of the firemen and the quickness with which the alarm was given. The fire will not in any way interfere with the operation of the mills nor cause any delay in filling orders for cabinet woods.

The principal office of the Davidson Pump Company will, after May 1, be at No. 77 Liberty street, New York, where all communications should be addressed after that date. The company manufactures the Davidson improved steam pump and hydraulic machinery of all kinds.

The Rail Market.

Steel Rails.—A number of small sales are reported, but the market is rather dull and quotations are slightly lower, ranging from $33.50 to $34.50 per ton at mill for rails of ordinary section. The most active demand now appears to be for light rails, which are quoted at $35 to $38 according to section. The mills will be pretty full for two months to come, but makers seem to be getting a little anxious about orders for the latter part of the summer.

Rail Fastenings.—Spikes are still quoted at $2.50 per 100 lbs. at Pittsburgh, but the quotations are entirely nominal and such sales as have been made are said to have been at $2.35 to $2.45. Track-bolts are a little steadier at from $2.60 to $3 per 100 lbs., and splice bars are quoted at from 1.65 to 1.85 cents per lb.

Old Rails.—Old iron rails are in considerable demand but there is so much difference of opinion between holders and buyers as to prices that no sales are reported and it is almost impossible to make definite quotations. Buyers are not willing to pay over $22 per ton at tide-water, but holders ask all the way from $22.50 to $24.

Blast Furnaces of the United States.

The *Iron Age* gives the following statement of the condition of the blast furnaces of the United States, on April 1:

	In blast.	Out of blast.	Not reported.	Total.
Charcoal	62	185	4	251
Anthracite	107	121	3	231
Bituminous or coke.	100	126	1	227
Total	269	432	8	709

The average weekly capacity of the 269 furnaces in blast is 85,561 tons; of the 432 out of blast 82,679 tons.

The *Iron Age* says: "It will be seen from these tables that there is but little change since Jan. 1. The tables, however, show some interesting facts that are worthy of comment. In the first place the 107 anthracite furnaces in blast and the 100 bituminous have a larger capacity than the 121 and 126 out of blast of each kind, respectively, indicating that it is the best located and the most productive furnaces that are in blast. It will also be noted that the 269 furnaces in blast of the 701 reported upon have a larger capacity than the 432 out of blast. It is also noteworthy that the 100 bituminous furnaces in blast April 1 have nearly 4,000 tons greater weekly capacity than the 101 in blast Jan. 1."

The condition of the blast furnaces reported on April 1 for eight years past has been as follows:

	'77.	'78.	'79.	'80.	'81.	'82.	'83.	'84.
In blast	218	252	241	431	453	457	375	269
Out of blast	488	458	463	260	270	281	334	432
Total	706	710	704	691	703	738	709	701

Of the change during the past year, the *Age* says: "This is a marked change, 100 furnaces having been transferred from one side of the account to the other, of which 49 are anthracite and 21 bituminous. This must have a marked effect upon make. This is shown more properly by the statement of capacities. The following are the capacities of the furnaces in blast, April 1, 1883 and 1884: in 1883, 96,449 tons; in 1884, 75,661 tons. This would indicate a falling off in production of, say, 10,000 tons a week, or 130,000 tons in the quarter. It is a remarkable fact, however, that the bituminous capacity shows a positive increase, though there are 21 furnaces less in blast."

Proper Compensation for Railroad Curves.

At the semi-monthly meeting of the American Society of Civil Engineers April 2, a paper by the late Wm. R. Morley, M. Am. Soc. C. E., on the "Proper Compensation for Railroad Curves," which had been read at a previous meeting of the Society, was discussed.

Mr. A. A. ROBINSON said that the location of the New Mexico extension of the Atchison, Topeka & Santa Fe Railroad was made with the standard of compensation based upon the theory that each degree of curvature was the equivalent in resistance to the movement of trains of 0.05 of a foot per 100 of ascent. After the construction it was found, first, that upon maximum gradients of 0.6 per cent. where a full train was 30 to 32 loaded cars, this compensation was hardly sufficient; second, upon maximum gradients of 1.13 per cent. with full train of 18 to 20 cars, it was fully sufficient; third. upon maximum gradient of 3.4 per cent. with full train of 7 to 8 cars it was evidently greater than was needed. Mr. Robinson considers that the resistance due to curvature is affected by so many conditions that it cannot be determined by mathematical formula except for the particular conditions assumed in a special case. The speed of the train, the elevation of rail, the greater length of outer rail, the gauge of track as compared with that of the wheels, all affect the question, and the resultant of all the forces will be a function not only of the rate of curvature and of the gross tonnage of the train, but also of the number of cars in the train. A train of 10 cars will produce a resistance greater than 10 times that of a single car. Upon a division of the railroad where locomotives can pull 30 cars the rate of compensation should be greater than upon a division where engines can pull but 10 cars. In practice Mr. Robinson has adopted the following rules for compensation:

Rate of maximum grade 0.0 to 0.6 per 100, compensation 0.06 per 100.

Rate of maximum grade 0.6 to 1.6 per 100, compensation 0.05 per 100.

Rate of maximum grade 1.6 to 3.0 per 100, compensation 0.04 per 100.

Mr. WM. H. SEARLES discussed mathematically the nature and amount of the increase of resistance on curves, due to the increase in number of cars upon a train, and deduced a general formula, leading to the conclusion that a difference existed, but was not important. He also expressed the opinion that widening the gauge on curves was not an advantage as far as a 4-wheel truck is concerned.

Mr. LEWIS KINGMAN said that on the Atlantic & Pacific Railroad the compensation 0.05 per degree was adopted for all curves; that 10-degree curves were the maximum, and that all curves were eased off at both ends by compounding gradually from the tangent to the full degree of curvature. This practice he considered of great value, and of very slight additional expense. From careful observations upon the action of locomotives pulling trains upon curves, it is his opinion that the compensation should vary with the grade. He mentioned an instance where a heavy train moving easily at six miles or more per hour up a grade stopped dead on a long heavy curve compensated at the rate of 0.05 per cent. per degree of curvature, and could not be moved therefrom without assistance of another engine.

Mr. A. M. WELLINGTON said that the rule adopted by him for the southern lines of the Mexican Central Railway was, for the high grades, the same as that of Mr. Morley, viz., 0.04 per degree of curvature, but that he had not, as Mr. Morley, had increased this to 0.06 per degree on lower grades. The theory upon which this was done was formerly advocated by Mr. Wellington, but he now believes from further investigation, both experimental and theoretical, that no sensible difference exists due to the length of the trains itself and nothing else. No absolutely fixed rate of compensation ought to be made. Circumstances of location may make it

inexpedient to adopt a rate of compensation which otherwise might be desirable. The rate of compensation of 0.1 per degree is higher than is ever necessary, unless in certain cases at stations, or where it may become a question whether to admit certain sharp curves at all. It is extremely probable that curve resistance is materially greater at very slow speeds. It is unfortunate that further and more complete experiments cannot be secured than have already been made.

Mr. M. N. FORNEY referred to the fact that the conditions of rolling stock and of track were very important elements in any experiments that could be made upon this subject. Different car-builders made cars and trucks and wheels according to their individual notions. Engineers made the section of rail according to their individual notions. The actual condition of the rolling stock of the country was such that it was doubtful whether any experiments could be relied upon as determining results which could be applied generally.

Mr. WELLINGTON expressed the opinion that while it was perfectly true that the condition of rolling stock was as stated by Mr. Forney, yet that experiments properly made could be relied upon to give fair average data.

The subject was further discussed by members present.

Prices of Frogs.

Present ruling prices for frogs are about as follows, for 60 to 66-lb. rails:

Spring rail frogs, 15 ft.	$30@33
Stiff frogs, 8 ft. long	25@26
" " 12 "	20@28

Extra length, weight, etc., at the rate of about 2 cts. per pound.

The Electric Headlight for Locomotives.

At 7:?5 o'clock last evening the only successful electric locomotive headlight in the world, and something never before seen in this city, arrived at the Little Miami Depot on engine No. 460 of the Pittsburgh, Cincinnati & St. Louis Railroad. The occasion of the presence of this wonderful invention in this city was the arrival of a number of railroad magnates and others who are here to attend the Time Convention for the arrangement of the summer schedules. * * *

The inventor, Mr. M. N. Lynn, of Rising Sun, Ind., also accompanied the party, who were met at Columbus by Mr. Ralph Peters, Superintendent of the Little Miami Division. Mr. Long was seen at the Grand Hotel by a reporter last evening. He said that the engine on which the light was used had been so equipped for the past 60 days. The light was at first put on as an experiment, but it had shown itself to be a success in every way. The locomotive had up to yesterday morning been running on the Pan Handle road from Bradford Junction to Indianapolis. The fact of it having the light in question attached to it was the cause of its being selected to bring the officials to town, and at the same time show what the light could do.

Relative to the light which so many have tried to perfect and failed, Mr. Long said it was the ordinary carbon light, similar to those burned in this city. The great difficulty with inventors heretofore had existed in their inability to so arrange the carbons that a constant point of contact could be assured during the jolting of the locomotive while in motion. By the Lynn invention, which is but a small addition to the ordinary lamp, the desired point is reached. The dynamo which generates the electric current is situated on the footboard which runs along the left-hand side of the boiler, and is directly in front of the cab window. By a mechanical invention a little independent engine of about 1½ horse-power is constructed with the dynamo. The large boiler is tapped and supplies the said little engine with steam, which of course can be turned on or off at pleasure. Mr. Long was exceedingly gratified with the result obtained by the experiment. As an illustration, he said that where heretofore an engineer could not see 100 ft. ahead of his engine, with a reflector and an electric light the track was made bright as day. He stated as an actual fact that an engineer had at night, with the aid of the electric light, seen a tie lying across the tracks a mile away. The light can be seen a distance of 10 miles, and its rays extend fully 5 miles ahead, thus making it an invaluable acquisition for the prevention of collisions while going around curves, as two locomotives coming in opposite directions would throw the light in the same manner. He prophesied that now that the article had been found the railroads would be but a short time in adopting it. The light on No. 460 had traveled over 12,000 miles since being placed in position. It had in no way needed any repairs or showed signs of failing. All that is necessary, as with the electric lamps, is to renew the carbons.—*Cincinnati News-Journal, April* 9.

Color-Blindness.

Mr. J. E Childs, Superintendent of the New York & Western road has issued an order requiring all the employés connected with the road to be examined for the purpose of testing their abilities to distinguish the various colors. The method of examination is not announced, but will probably be the same as that which has been used on the Pennsylvania and a number of other roads.

Better Stock Cars Wanted.

At the recent meeting of the Wyoming Stock Growers' Association at Cheyenne, Wy., the question of stock cars was discussed, and all present agreed that radical improvements, especially in the running gear, had become necessary. Strong resolutions were adopted inviting the attention of railroad companies to a number of specific requirements in the construction of these cars to overcome the evils complained of. The car-truck in use on the Northern Pacific was exhibited at the meeting, and called out favorable comments.

The Brooks Locomotive Works School for Apprentices.

The first anniversary of the apprentices' night school at the Brooks Locomotive Works was held in Dunkirk, N. Y., on the evening of April 2. This school was founded a year ago by Mr. H. G. Brooks, President of the works, for the benefit of the young men employed as apprentices in the shops, and its foundation was the result of Mr. Brooks' recollections of the difficulties which he himself encountered when a boy. The school has been largely attended by those for whose benefit it was founded. The first part of the proceedings at the anniversary consisted of the usual exercises of a session of the school. After this was closed, Mr. Brooks, who presided, received the report of the Principal of the school, Mr. Pierce Butler, and of the instructor in drawing. He then made a brief address to the pupils of the school and the visitors present, setting forth the wide interest which this school had excited in similar establishments throughout the country, and encouraging them to go on, to assist and do their part in making it the model for similar institutions which were sure to be founded. Prizes were then awarded as follows: First prize, $100, L. J. Kaiser; second prize, $75, William Fan; third prize, $50, Charles Brown; fourth prize, $50, Thomas Meakin; fifth prize, $15, John Hefferman; sixth prize, $10, Frank Gibbon. The manner of selecting the pupils receiving these prizes has been to carefully watch the progress of each student, and to note the degree of proficiency attained by him in the several studies pursued. Mr. George B. Mortell received a position in the drafting-room of the works, which was promised to the pupil who had made the most progress in the drawing class.

Protection Against Misplaced Switches.

A new device to lessen the danger from misplaced switches (which is a great one) consists of a brittle metallic tube, connected with the air pipe of any air brake and projecting from the sides of the car so as to strike against an arm worked by wires from the switch-stand The breaking of the tube will, of course, at once set the brakes, and the apparatus is set sufficiently far away from the switch to enable the headway of the train to be substantially destroyed before reaching it.

The general idea of this device seems feasible, but the details of the plan seem to have certain objectionable elements. A "brittle metallic tube" projecting from the side of the car would be liable to both malicious and accidental fracture, and the contrivance might also be a source of danger to trainmen. Some arrangement would also have to be included to make the tube movable so that the train should be able to take the switch when in any position, if desired.

The number of such accidents is large, and they are apt to be especially destructive. According to our record for 1883 about 8 per cent. of our total list came from this cause, as follows:

	Total No. in 1883.	Caused by misplaced switches.	P.c.
Collisions	630	42	6.7
Derailments	1 010	89	8.8
Total	1,640	131	8.0

A device intended to partially guard against this source of accident by giving an automatic signal from an alarm clock some minutes before the arrival of each express train, so that switches could be inspected in time, was described in our issue of Feb. 15 last, under the title of "A Switch-Inspection Monitor." The check arising from such a device, however, is of course not positive and absolute, and anything which would automatically set the brakes in a train approaching a misplaced switch might greatly reduce the number of such accidents.

A rocker placed in the middle of the track so as to project about an inch above the level of the rails, when set by a misplaced switch, with a brittle tube projecting downward so as always to strike against the rocker, when set, *unless it was held up by hand* would seem to obviate many of the objections to the plan as described while accomplishing equally well the desired end. Such a device, it would seem, might be so designed as to be very cheap without injuring its effectiveness, since the necessity of compensating for temperature might be avoided and still leave the movements of the apparatus sufficiently positive and exact. It would, however, be open to the objection that a stone, or any obstruction small enough to clear the pilot of the locomotive, might strike the tube and set the brakes.

Stadia Measurements.

Van Nostrand's Engineering Magazine for April, 1884, contains an excellent article on stadia measurements, by Mr. Arthur Winslow, Assistant Geologist on the Pennsylvania State Geological Survey, with tables. Those who have occasion to use stadia measurements will find the tables convenient.

Boiler Explosions in England.

Engineering gives the following summary of the number of English boiler explosions for two periods, 1873 to 1878, inclusive, and 1879 to 1883, as follows:

Six years to 1878:

1873.	1874.	1875.	1876.	1877.	1878.	Yearly average.
78	76	68	39	44	46	58.5

Five years to 1883:

1879.	1880.	1881.	1882.	1883.	Yearly average.
30	31	33	38	39	34.05

The average number of explosions and of casualties from them in each year was:

	1873-78.	1879-83.
Average No. of explosions	38.50	34.05
Killed per explosion	1.16	1.23
Injured per explosion	1 98	1.59
Killed and injured per explosion	3.14	2.82

Even the great reduction in the average number of the explosions from 58½ to 34 does not adequately represent the improvement, for there has been a great increase in the number of boilers in use, the latter period covering a time of very great industrial growth, while the former was one of comparative stagnation.

Of the explosions last year 6 were in small tugs or boats, 15 in various large works, where the care of boilers ought to be understood, 17 in small shops and in use on farms or by contractors, *none* on steamers, and only one on a railroad.

A Palace on Wheels.

The parlor palace car built at the order of the late Harry E. Packer is now completed and at the Lehigh Valley shops in South Easton, where it was constructed. It is 60 ft. long and 10 wide, fitted with two six-wheel trucks, Allen paper wheels, and Miller and Janney interchangeable couplings. The exterior is painted a tuscan red, ornamented with gold. The name "Minerva" is painted on the sides in gold script.

The interior of the car is divided into various compartments. To the left on entering is the gentlemen's toilet room, with stationary washstand, with Fermosa marble top and beveled glass mirror. Next is the kitchen, 8x6½ ft. In it is a range, on which one can broil, boil and bake at the same time, while there is room beside for other cooking. In closets, arranged on all sides, are boxes for spices, sugar, coffee, salt, rice and the like, cupboards filled with every utensil needed in cooking, an ice-chest and an apartment for keeping bread moist. The kitchen, hall and gentlemen's room are fitted in oak, with hard finish. The butler's pantry is next entered. Here are closets for china, cut glass, knives, forks, napkin rings and other table furnishings. The room is finished in mahogany. The china is Haviland make, hand painted in carnation pinks, the favorite flower of Judge Harry Packer's mother. Each piece bears the name "Minerva." Two berths for the butler and cook are hidden in this room.

Next is the ladies' dressing room, with marble-top stationary wash-stand, beveled glass mirror and closets for dresses and wraps. Adjoining is the private sleeping room. These two apartments are connected by a door, and are fitted in Persian silk lampas, easy chairs and an exquisite Axminster carpet. In the private room is a folding bed, used during the day as a secretary and bureau. The bed is of cherry, veneered with bird's-eye maple.

Next is the parlor, dining saloon and sleeping apartment. It is finished with an extension table, folding sofa, easy chair and six embossed leather dining chairs. At the end is a handsomely carved chiffonnier, under which is a safe for the silverware and other valuables. Above is a neat and pretty bookcase. By introducing small tables, which fasten into the sides of the car, the parlor is transformed into a dining saloon. At night small nickel posts are set in sockets, canvas stretched across them, and four beds can thus be made. There are also four upper berths. The room is finished in cherry and bird's eye maple. The upper berths are of mahogany, inlaid with carnation pinks and daisies. The upholstery in the room is a rich tapestry of black ground with raised Gobelin pattern. The window and berth curtains are of pure silk, double-faced, chenille Turkoman. The hallway is hung in the latest designs of curtains of India red-tinted Ganges cloth.

The observation room is at the end of the car, and is finished in blistered mahogany, with Axminster carpet, easy chairs and lounge. The drapery is an exquisitely soft finished velour design of Bombay boskins. All the window shades are of tinsel surah tapestry in a decorative Venetian pattern, the material being made expressly for this car at Lyons, France.

The ceiling of the car is embossed leather. The light is from gas ignited by electricity and extinguished in the same way. The car is provided with tanks capable of supplying the 21 burners 54 hours. Hot and cold water run to the toilet rooms. An electric call bell with attachment in each room rings in the butler's pantry.

Throughout the car is a marvel of neatness and fine work. It is not open to the public and has never been seen by the one for whom it was built. Judge Packer saw the plans, approved them and ordered the car built, but he never saw it in course of construction, though it was to all purposes completed before he died. Its cost was borne by him and not by the company of which he was President.—*Philadelphia Press.*

The last sentence deserves particular attention.

Errors in Long Lines of Level.

Mr. C. C. Vermeule, of the Topographical Survey of New Jersey, gives as the result of some 10,000 miles of leveling that the error is not at all proportional to the distance, but apt to be as great in runs of 5 miles as 50. This, however, can hardly be the case as a general average, if there be any truth in the theory of "probable error" computations. On the survey there was a primary system of levels, run with a 15 in. level and correct to 0.10 ft., and a secondary with light 11 in. level, with a standard of 0.25 error in secondary tests made every 5 miles, experience showing that errors of this size do not accumulate objectionably, while the standard is quite readily maintained.

These figures correspond closely with average results obtained on railroad surveys, on which it is a mere affectation and waste of time to carry out level-notes to thousandths of a foot, or adopt the precautions and over-care in taking readings necessary to make even a pretense of such accuracy, or rather precision—a very different matter from accuracy, although the distinction is not always borne in mind.

Steel Car Wheels.

On April 7, 1873, four Bochum cast-steel wheels were put under one of the trucks of the tender of the locomotive "Daniel Tyler" on the Boston & Providence road. These wheels were turned in April, 1879, and are still in use and in good condition, having been in service 11 years and having run in that time 246,653 miles, an average of 22,423 miles yearly.

The Arlberg Tunnel.

The Arlberg Tunnel occupies the third place in the list of underground passes of the Alps. Its construction was determined by the Austrian government immediately upon the German tariff coming into operation, with the purpose of increasing the intimacy of the relations between their own country and Switzerland and to the detriment of the German railways. The opening of the St. Gothard route had made a great difference to the Swiss markets, and it was necessary to prevent the trade formerly done with Austria being diverted into other channels. While providing an outlet for the products of the country the new line also serves as a through line. The line is divided into two sections. The first, 44 miles long, cost $82,835 per mile, and was opened on July 1. The second, a mountain line 40 miles long, is estimated to cost $145,800 per mile. The tunnel on this section is 10 26 kilom. (6⅜ miles) long and is estimated to have cost $7,880,000.

On May 15, 1880, the Department of State Railways received the order to commence the preliminary works. On June 24 the headings were begun at both ends, on Nov. 13 the mechanical boring apparatus was set to work and on Nov. 13, 1883, exactly three years afterward, the galleries met. The following table gives a comparison of the three tunnels, Mont Cenis, St. Gothard and the Arlberg:

	Length, miles.	Time building, years.	Daily advance, feet.	Cost per foot.
Mont Cenis	7.60	13.1	7.7	$36.50
St. Gothard	9.27	7.4	18 0	21.63
Arlberg	6.37	3.4	27.2	16.74

The cost of the last tunnel is partly estimated and comprises the expenses of the mechanical installations and the buildings at the two portals.

If the same rapid ratio of progress can be continued it is difficult to conjecture what ultimate limit the feasible length of tunnels may reach.

THE SCRAP HEAP.

Damages for Killing an Employe.

Four years ago Oct. 14 last, James Dwyer, of this city, a fireman on the Albany & Susquehanna Railway, was killed by an explosion of an engine at Oneonta. Mr. Mann, the engineer was killed at the same time. Suits have been pending in the courts most of the time since, until recently, growing out of the accident.

Mrs. Anna Dwyer brought suit very soon after the death of her husband, and the end was only reached about the time of the last Circuit in this city, the case being on the calendar at that time for trial.

Mrs. Dwyer, on the first trial, recovered a verdict of $3,000. The case was appealed and reversed by the General Term, which granted a new trial. The case was then taken to the Court of Appeals, which settled the law against the company and ordered a new trial. Meanwhile Mrs. Mann, who had sued the company, was having similar experience, and the Dwyer case was allowed to rest pending her action. On the first trial Mrs. Mann got a verdict, which was increased on the second, and after being taken to the court of last resort was affirmed.

Before Mrs. Dwyer's case came to trial the last time offers of compromise were made and accepted. The company paid $3,500 with interest from the time of the accident. Mrs. Dwyer, who is a sister of J. W. Sullivan, receives in principal and interest, clear of all expenses, $3,800.—*Binghamton (N. Y.) Times.*

What He Wanted.

The Air Line passenger train was rapidly speeding over the rails between Atlanta and Gainesville, when a man came rushing from a field, and down toward it, frantically

waving an old red shirt. Instantly the engineer applied the air brakes and came to a dead halt.

"Whar's ther conductor?" gasped the signal carrier, as he eyed the smutty face of the fireman.

"Here I am," excitedly cried the sought-for officer, "what's wrong?"

"Thunderation?" gasped the man. "ever' thing's wrong; the old 'oman, Jim, an' the rest of o' my crowd hev gone to town, 'an I can't git—"

"Come on," yelled the conductor, "we will help you get it off."

"Git what off, mister?"

"Ain't there something across the track?"

"No. sirree; an' I didn't say thar wuz. I only sed that my folks is gone off somewhar, an' I can't git—"

"Get what?" shrieked the officer, as the farmer paused.

"Wall, if ye'll let me 'lone I'll tell ye arter 'while," and the man sat complacently down on a stump.

The train had been stopped now for fifteen minutes, and the conductor was boiling hot.

Presently the stranger arose and said:

"Now, if ye'll keep yer 'tater trap shut for a seckund I'll tell ye what's the trouble."

"Well, proceed and hurry."

After taking a big chew of tobacco the farmer continued: "As I sed afore, my gang all trotted off to-day and I couldn't get no grub, kase I hedn't nuthin' to start a fire with. Will one o' ye gentleman give the old man a few matches?"

For once the check of a conductor was outdone, and after assisting the farmer over a fence or two, the train moved on.—*Atlanta (Ga.) Constitution.*

Railroad Young Men's Christian Association.

The Young Men's Christian Association of Atlanta, Ga., recently held a special conference and resolved to organize a railroad branch in that city. Valuable suggestions were made by Mr. Thomas K. McCree, Secretary of the International Committee, and promises of support were made by officers of the Atlanta & West Point, the Georgia, the Richmond & Danville and the Western & Atlantic roads.

Wanted to Feed a Dog.

Five minutes for refreshments was shouted by the brakeman, and as he knew the train always stopped at that station for that purpose, he understood the meaning of the brakeman's utterance and got out and proceeded to the counter. He gazed at the sandwiches, but they had evidently been made that day; he glanced at some cold beef, but it was evidently well cooked and healthy; so with the fowl and the bread and the pies. Even an apple turn-over didn't appear to have been made over a week and hadn't got the real dangerous look to it.

"Nice railroad restaurant this is?" he growled.

"What's the matter?" asked the proprietor.

"Ain't you ashamed of your food?"

"No, sir; it's fresh and wholesome; what are you growling about?"

"That's what I'm growling about! I want to get something of the real railway restaurant sort, to feed to a dog a man has got in the car there, so the brute will die."—*Boston Post.*

He Had Enough.

On the Bay City train coming into Detroit the other day was a great big hulk of a fellow with a voice deep enough to shake the foundations of a house and a disposition to eat somebody up. He got into trouble with three or four different men in the smoking car, all of whom left it to avoid trouble. This encouraged the man with the belief that he could run the whole train, and he was observing that he had come down from the lumber camps to sniff the fresh air and start a graveyard or two when a brakeman who had caught on quietly took a seat beside him.

"Stranger," said the overgrown chap as he limbered up his arms, "are you prepared to die?"

The brakeman acknowledged that he wasn't.

"Say! How would you like to step out on the platform at the next station and stand before me fur two minits?"

The brakeman rather liked the idea.

"You will, eh? Say! Jist feel o' that! Then smell of it?"

"Don't rub my nose like that again, sir!" warned the railroader.

"Why not?"

"Because you might get hurt!"

He had scarcely spoken when the big fist rubbed itself against his nasal organ, but something more than words followed. In about a New Jersey second he had the big man by the throat and jammed him into a corner, and there he held him until the man who wanted to go into the graveyard business turned the color of a horse-plum, exhibited all the tongue he had and made signals that he would even sell his shirt to bring about an amicable settlement of affairs.

"Got enough?" asked the brakeman.

"Y-you bet!"

"Will you keep quiet?"

"Y-yes!"

With that he was released, and for a long ten minutes he had nothing to say. Then a sickly smile crossed his face and he leaned over to the man in the seat ahead and whispered:

"He was the man I wanted to step out before me at the next station."

"Yes."

"Say, stranger," continued the big passenger, as he felt of his neck and sort o' licked his chops—"supposing he had!"—*Detroit Free Press.*

Trackmen Paying for Their Rashness.

A dispatch from Wernersville, Pa., April 2, says: "An accident on the Lebanon Valley Railroad a short distance west of here last evening resulted in severely injuring seven repairsmen. They had been at work near Womelsdorf, and at 5 o'clock prepared to return home. They had two small hand-trucks, and when the evening passenger train for Reading reached Womelsdorf the men hitched up the trucks behind the train and then got on. All went well until the train passed a switch just west of Wernersville. Suddenly one of the front wheels of the front truck broke, wrecking the front truck. The second truck piled over the first as both became detached from the train, and the 10 men, with their tools, clothing, dinner kettles, etc., were thrown in all directions. One man was thrown 36 ft. into a pile of coal. Others were hurled headlong down a bank, while others were pitched face downward on the track with great force, for the train was going at a high rate of speed."

Shut in by Fire.

The train from Columbia, due here last night at 7:30 o'clock, arrived an hour and 50 minutes behind time. The delay was caused by a fire in the woods near Chester that burned across the railroad track, entirely destroying it in several places. Passengers who came in on the train report having had a thrilling experience amidst the roaring flames, the train being caught so that for a time it could neither go forward nor backward. As the train approached the burning woods, the engineer saw great volumes of smoke sweeping across the track ahead, but by pulling open the throttle the train bounded on and passed before the flames reached the track. It was then supposed that all danger was over, but before a mile had been traveled the train was stopped by another fire that was raging across the track in front of it. Seeing it altogether impossible to advance the engineer started to back the train, but had scarcely begun the backward journey before the rear coach ran into a bed of fire, the flames having crossed the track to the rear of the train. The situation was startling in the extreme, and the passengers were terribly frightened. Fortunately the fire in front shortly died down, the track was patched up and the imprisoned train slipped through its environment of fire. The scene was wild in its grandeur, the great volumes of smoke and the leaping flames being driven across the track by a wind that amounted to almost a gale. Telegraph poles were burned down, a large portion of the track and a considerable area of woodland was destroyed. The fire in the woods originated from brush heaps in a new ground.—*Charlotte (N. C.) Observer, April 3.*

Directions for Travelers.

A Rochester lawyer has brought home from Italy the advertisement of the "Vesuvius Wire Railway," which contains some amusing examples of "English as she is wrote." The following are illustrations:

"Carriages belonging to the Wire Railway Company are only allowed to stop on their way for momentaneous repose of the horses.

"☞ No drinking-money is due to coachmen.

"At the interior station on Mount Vesuvius passengers will receive a centre-ticket and conformly to its order's number they will take place in the train.

"The train is composed of ten passengers. Those who willingly loose their turn cann profit of the next train always when there is an empty seat, but cannot pretend a special train.

"The company is not responsable to foreigners who would serve them selves of guides not belonging to the same, or having no number.

"Guides have to behave themselves most politeful towards foreigners in showing them all the particularitys of the crater to accompany them during the ascent and descent and bring them round the crater, but are not obliged to follow them in the dangerous locality of which they will be advised. They are not obliged to gather stones or to do impressions unless they have not bargained with them before.

"The station's buffet is provided of all things that travellers could desire at the same prices fixed by the company.

"The station's telegraph-office is open to the public, and telegram can be wired to all destinations at the usual tariff.

"Foreigners can retire from the Naples Office photos acquired on Mount Vesuvius, and will even be braught to their residence if they require it.

"In this case a receipt will be given to them for their relative payment, and which will serve at the same time to control and retire the articles acquired."

A Locomotive Spoils a Fox Hunt.

Early in the morning of the 23d ult. a valuable hound owned by Samuel Wardwell, of Oxford, struck the hot trail of a fox. Mr. Wardwell recently refused to take $100 for this hound. Toward noon, after a long, hard chase, the fox and hound were seen running along the railroad track near Mount Rocky Church. The rumbling of a coming train was heard. As soon as the locomotive swung around the curve the fox seemed to give out. "The poor fox," said the engineer, "could hardly drag one leg after the other. It staggered along a few yards and then fell all in a heap, quivering as if in the agonies of death. Rousing to one last despairing effort by the nearing cries of the hound, it rose to its feet, staggered wildly and fell all in a heap right in front of the engine. The dog was about to grab it, when suddenly the fox gave a tremendous leap, passing over the corner of the cow catcher and out of danger. The unwary hound was caught and ground to death between the wheels of the onrushing train." "That darn fox," added the fireman, "actually looked around and grinned as the train passed over the dog."—*Portland (Me.) Argus.*

Names.

The following are some of the euphonious names of the sleeping cars on the Canadian Pacific railroad: Kaministiquia, Qu' Appelle: Wanapitae, Nasbonsing, Wabigoon, Kananiskis, Nipissing, Madawaska.

A Narrow Escape.

A dispatch from Longview, Tex., April 8, to the Fort Worth *Gazette* says: "To-day a stringer in a trestle on the Texas Pacific, just east of Gladewater, gave way as a freight train passed over it, but the train went safely over. The regular west-bound passenger, due at that point shortly afterward, was not notified of the accident, and thundered over the trestle at 30 miles an hour, thereby certainly avoiding what might have proven another railroad horror. The stringer had simply been permitted to rot away, and the escape of the passenger train was marvelous. The passengers had a rough shaking up. The break was quickly repaired, and no delay to the following train occured."

Mountain Snows in Colorado.

A Durango, Col., dispatch of April 6 says: "To-day is the 63d day since the first train was blocked on the Conejos Range. Only one train during that time has attempted to run from Denver to Durango, and that was on March 4. It got caught three miles east of Cumbres, where it remained for 21 days, when Superintendent Lydon succeeded in shoveling it out. That was 10 days ago. Yesterday he succeeded in working his way to Antonito, making 31 days from Chama. Last night his work train, after taking on supplies, returned to Osier, and to-day his men are clearing the track of some of the late fallen snow, between there and Cumbres. It looks to-night as though Wednesday of this week will see a through train from Denver. The weather now looks settled. We have no snow here, and can hardly realize that the Conejos range is covered with 12 to 15 ft. of snow. During the last week a number of merchants have taken the train to Chama and expect to snow-shoe over the range. Work is progressing between here and Silverton. The shoveling force is about four miles this side of Silverton, and two miles of that distance is a mass of very large snow slides which cannot be shoveled but must be chopped, picked and hauled out. They will have this part of the road open nearly as soon as the Conejos Range."

The Bouncer Bit.

It warms the cockles of one's heart—whatever they are—to hear of any one getting the best of one of these bloated monopolies. Last week the conductor of a S. P. train discovered a passenger occupying the wrong berth in a suspicious manner. The detected party sassed back, when the conductor deliberately pulled the cord, removed his coat and vest, rolled up his sleeves, and announced his intention of slamming the other man off the train. The latter agreed to get off quietly if he were allowed to dress. It was only after the train had started again and run about 50 miles that the conductor discovered that in the confusion the expelled party had put on the official's coat and vest, the latter containing a fine gold watch and $900 in bank notes.—*San Francisco Evening Post.*

Locomotive Hunting Deer.

One day last week, just as engine No. 173. M. A. Cormer, engineer, approached Lewis tunnel, on the Chesapeake & Ohio road, a deer was chased on the track by several dogs. The deer started through the tunnel with the train after him, and when he had gotten about half through he stopped and commenced jumping up and down until the engine struck him. He was thrown up against the head-light and instantly killed.—*Staunton (Va.) Vindicator*

The Car Inspector.

The car inspector's position is an humble but important one. The railroads are more appreciative of his duties than in years gone by, and the best-managed roads are as careful in their appointment of car inspectors as in the selection of train dispatchers. If either makes a mistake it is irreparable and fatal. A drunken or incompetent dispatcher might cause two trains to crash into each other with frightful loss of life and property; a car inspector, through negligence or unfitness, might suffer a broken wheel or a disordered brake to pass unnoticed until a car broke down wrecked, or a train plunged into a broken bridge, because the brake would not work. So much machinery and apparatus is in use on a passenger coach that an inspector, to be competent, must be an intelligent mechanic. He must know the effect of heat and cold upon metal, and must comprehend the effect of contraction and expansion; he must be a wood and iron worker, he must understand the properties of steam and compressed air; must be acquainted with the mechanism of automatic steam, and air brakes, and be able to adjust them if faulty; he must know what a hot box or a flat wheel is, and the remedy; he must be able to detect a loose wheel—one that revolves on the axle instead of with it; his ear must be so attuned that he will know by the sound when he strikes a wheel whether it be cracked or broken or whole; he must know how far the running gear may be defective and yet be temporarily safe; he must be quick in forming judgment, alert of muscle and argus-eyed and primarily he must know all about a car from the flange to the roof ventilators. Their negative qualifications are almost as important. He must not be afraid of oil or smut: he must dive in among the wheels and springs, and brake rods and lie at length, perhaps on his back, on the track, where a single wave of a brakeman's lantern might bring destruction upon him.

Numerically considered, the importance of the car inspector asserts itself. There are over 100 inspectors in this city, and every station where change of cars is made or where shops are located has its army of them. There are day and night inspectors for freight and passenger cars. No through passenger train touches this city, day or night, that does not undergo inspection, and the tinker of inspectors, the hammer and the flare of their flambeau and the hiss of the air or steam as they try the brake, have been observed a thousand times by every traveler. To the thinking passenger the noise and the light are not nuisances, but the evidence of careful management and security. Every day these guardians find something wrong with a car—some defect, which means danger. Recently every train which passed over a certain section of an Indianapolis line received one or more broken wheels. The inspectors discovered the breaks, and, finding them repeated and always on the same side of the track, concluded that a rail or frog somewhere was defective. After a protracted search, a frog half out of position, and calculated to do infinite mischief, was discovered. The front cars, generally the postal or baggage car, are most frequently disabled. This is because they are lighter built and are the first after the engine to encounter and perhaps remove obstructions on the track.

"Our lot is not particularly happy," said a chief of a gang of inspectors who had patiently waited four hours for a delayed express, "but it is just as necessary that that train be overhauled when she gets in, as that she have a conductor or engineer; and as our duties are indispensable, we feel about as important as the brass-buttoned brakeman or the diamond-studded chair car conductor."—*Indianapolis News.*

General Railroad News.

MEETINGS AND ANNOUNCEMENTS.

Meetings.

Meetings will be held as follows:

Central, of New Jersey, annual meeting, at the office in Jersey City, May 9, at noon. Transfer books close April 18.

Delaware & Hudson Canal Co., annual meeting, at the office in New York, May 13, at noon.

Lake Shore & Michigan Southern, annual meeting, at the office in Cleveland, O., May 7.

Michigan Central, annual meeting, at the office in Detroit, Mich., May 8.

Pittsburgh, Fort Wayne & Chicago, adjourned special meeting, at the office in Pittsburgh, at 11 a. m, on May 1.

Dividends.

Dividends have been declared as follows:

Baltimore & Ohio, 5 per cent., semi-annual, payable April 16 on Washington Branch stock, and May 16 on Main Stem stock.

Cedar Rapids & Missouri River (leased to Chicago & Northwestern), 1½ per cent., quarterly, on the common stock, payable May 1, to stockholders of record April 15.

Nashville, Chattanooga & St. Louis, 2 per cent., payable April 30. Transfer books close April 19. This company paid 2 per cent. Oct. 1, 1883.

Oregon Railway & Navigation Co., 1½ per cent., quarterly, payable May 1. Transfer books close April 21. This company drops from 2 per cent. in February and 2½ per cent. in November.

St. Louis, Jacksonville & Chicago (leased to Chicago & Alton), $3.45 per share on both preferred and common stock, payable April 21. to stockholders of record April 15.

Railroad and Technical Conventions.

Meetings and conventions of railroad associations and technical societies will be held as follows:

Association of American Railroad Superintendents, semi-annual meeting, at No. 46 Bond street, New York city, on Monday, April 21.

American Society of Mechanical Engineers, Spring meeting, in Pittsburgh, Pa., on Tuesday, May 20.

Railway Car Accountants' Association, annual convention, in Richmond, Va., on Tuesday, May 20. Western members are requested to meet in Ashland, Ky., May 18; Southern members in Atlanta, Ga., May 17, and Eastern members in Washington, May 19, to proceed to Richmond together.

American Institute of Mining Engineers, spring meeting, in Chicago, beginning on Tuesday, May 27.

American Society of Civil Engineers, annual convention, in Buffalo, N. Y., beginning on Tuesday, June 10. Full arrangements will soon be announced.

Master Car-Builders' Association, annual convention, in Saratoga, N. Y., beginning on Tuesday, June 10.
Master Mechanics' Association, annual convention, in Long Branch, N. J., beginning on Tuesday, June 17.
Railway Telegraph Superintendents' Association, annual convention, in Boston, on Tuesday, June 17.
General Baggage Agents' Association, semi-annual meeting, in Boston, on Wednesday, July 16.
Master Car-Painters' Association, annual convention, in Boston, on Wednesday, Sept. 3.
Road-Masters' Association of America, annual convention, in Indianapolis, Ind., on Wednesday, Sept. 10.
General Time Convention, fall meeting, at the Continental Hotel, Philadelphia, on Thursday, Oct. 9.
American Street Railway Association, annual convention, in New York, on Wednesday, Oct. 15.

Southern Railroad Time Convention.

The Southern Railroad Time Convention met in New York, April 16, with full attendance. It was resolved to continue the old time schedules in force during the summer, without material change.

The report of the Committee on Uniform Train Signals was presented, and the Convention took the same action thereon as the General Time Convention in Cincinnati, passing a resolution referring it to the managers of the several companies, with the request that its recommendations be adopted, and that they be put in force at the date the fall changes of time are made.

It was resolved to hold the fall meeting in New York, on Oct. 15 next.

Western Society of Engineers.

The 183d meeting was held in Chicago on Tuesday, April 1, at 4 p. m., Vice-President Randolph in the chair.

Mr. Wright, for Committee on Transportation, reported that this committee had a short paper for this meeting, and a paper for the next meeting by Mr. Randolph, on "The National Electric Signal."

The Secretary read a letter from Mr. Henry Manley, Chairman of Committee of Arrangements, inviting the officers and members of this society to attend the annual dinner of the Boston Society of Civil Engineers.

It was voted that the thanks of the society be presented to the Boston Society for this invitation.

Mr. Wright read a paper discussing an article by Mr. Samuel McElroy, in the *Railroad Gazette* of March 28, 1884, under the head of "Track Problems." After reading of the paper the discussion was continued, most of the members present taking part.

It was voted that the paper read by Mr. Wright should be printed.

The following circular has been issued by the Secretary, Mr. L. P. P. Morehouse, whose address is at the Illinois Central Railroad office, Chicago, Ill.:

"1. In accordance with a resolution adopted at the 182d meeting, members are requested to send cabinet photographs of themselves to the Secretary for presentation to the Society.

"2. Members whose address or names are incorrectly given in list of members lately published in the *Journal*, will please send corrections to the Secretary, for *Errata*.

"3. Members who have not yet paid the amounts they subscribed toward furnishing the Society rooms are hereby reminded of these subscriptions.

"4. The attention of members whose dues are delinquent is respectfully called to circular dated Feb. 12."

St. Louis Engineers' Club.

The St. Louis Engineers' Club met in that city on the evening of April 9, with a full attendance. The following new members were elected: E. A. Engler, N. W. Perkins, Jr., K. Tully, J. A. Vail and J. A. Ockerson.

A paper was read by Mr. James W. Hill on the "Wind Mill of To-day and Its Uses." He described the modern type of mill, illustrating his remarks from the working model and drawings, and showed the economy of this kind of motor for railroad water tanks, water supply of small towns and many other purposes. He claimed that the work done by the ordinary pumping wind mill was not a good test of the power that the mill was capable of developing, since the governor always keeps down the speed and so prevents the mill from using its maximum power. His paper was accompanied with a table giving the complete wind record for every hour in the whole of the year 1881 at St. Louis. The paper was generally discussed by the society, the members manifesting much interest.

A committee was appointed to arrange for an excursion of the club at an early day.

American Institute of Mining Engineers.

The following circular has been issued by the Secretary, Dr. R. W. Raymond, dated New York, April 10:

"I. The next meeting of the Institute will be held at Chicago, beginning Tuesday, May 27. The following programme is provisionally announced: Tuesday evening, opening session; Wednesday, excursions to South Chicago and Pullman; Wednesday evening, session; Thursday, excursion to La Salle and other points; Friday morning and afternoon, sessions; Friday evening, banquet.

"The hotels in Chicago will probably be crowded; and members desiring hotel accommodations should write at once to Mr. John Crerar, Jr., 109 Dearborn street, Chicago. Headquarters will be at the Grand Pacific Hotel. Board, from $3 to $5 per day, according to rooms.

"Members expecting to attend the meeting should notify the Secretary (Box 223, New York P. O.) at an early day. Arrangements as to railway facilities, etc., will be hereafter communicated to those who have so notified the Secretary.

"II. The Index to Vols. I.–X., inclusive, of the 'Transactions' is still in press, and will probably not be ready for distribution before the May meeting."

Engineers' Club of Philadelphia.

A special business meeting was held at the rooms in Philadelphia, March 15, President William Ludlow in the chair; about 35 members and 5 visitors present.

The board of directors presented, as their report, their minutes since last business meeting of the Club.

The following resolutions were unanimously adopted by the meeting:

"*Resolved*, That on and after the fifteenth day of March, 1884, all papers, descriptions, illustrations or explanations upon subjects of interest presented by the Committee on Information, or by invitation from the Club, be and are hereby allowed to occupy or take up 20 minutes only of the time of any club meeting, unless otherwise requested by a majority of the members then present at said meeting.

"*Resolved*, That any papers, etc., etc., as above, requiring a longer time than the said 20 minutes for their completion, may be continued at the next meeting following the one at which they are first presented.

"*Resolved*, That this rule shall not apply to the discussion following the reading to completion of any paper, etc., as above.

"*Resolved*, That the Secretary be and is hereby directed to print these resolutions in the next notices sent to all members, should the same meet the approval of the Club."

The resignations from active membership of Messrs. Jesse Lightfoot and C. B. Richards were read and accepted. The following gentlemen were elected active members of the Club: Messrs. Kenneth Allen, J. M. Rüdiger, Jr., Frederic C. Wootten, Edw. H. Barnes, Walter D. Heston, Robt. W. Lesley, Wm. Paul Gerhard, Jesse T. Vogdes, Jos. J. McKee, P. A. Taylor, Wm. Wharton, Jr., F. A. Dean, De Courcy May, Jas. Rowbottom, V. E. Briand de Morainville, Richard W. Jones, Augustus Dietz, Wm. H. Millard, James Christie, H. G. Stewart, W. A. Parry, Theo. J. Lewis, E. R. Wallace and B. K. Field.

Messrs. Frederic Graff, Chairman, J. N. DuBarry, James Worrall, James R. McClure and John H. Dye, the committee appointed to prepare the memorial of the late Past President, Mr. Strickland Kneass, presented the result of their sad but earnest work in a comprehensive review of the professional career and labors of the engineer, and a sincere tribute to the personal life of the Christian gentleman.

Mr. Robt. P. Field presented a description of a method he had used to obtain formulæ for switch calculations.

Mr. C. Henry Ott presented an account of a recent establishment of true meridian in Philadelphia.

Mr. William Lorenz presented blues of the steel superstructure which he had discussed at a recent meeting.

Messrs. Young & Sons, Phila., submitted sample of stake tacks. In the head of each is a concavity to admit point of rod. Thus another, although trifling, source of error may be eliminated, and the engineers' tacks may be more readily distinguished from others.

The regular monthly meeting was held in Philadelphia, April 5, Past-President Henry G. Morris in the chair; 36 members and 2 visitors present.

Mr. Henry G. Morris exhibited, on behalf of Mr. Israel W. Morris, two ancient and curious works upon mining:—"The Golden Treasury, or the Complete Minor, being Royal Institutions or Proposals for Articles to Establish and Confirm Laws, Liberties and Customs of Silver and Gold Mines," by Thom. Houghton, London, 1699, and "A collection of Scarce and Valuable Treatises upon Metals, Mines and Minerals," by James Hodges, London, 1740. The latter contains, *inter alia*, "How to know the Condition of the Earth by Taste;" "Of Juices, and first of Allum." "The Opinion that Quicksilver and Sulphur are the Matter whereof Metals are made, is defined." "How to know the ill Qualities that infect the Oar, and how to purge them away." "Wherein is showed how true and perfect Gold may be made by Art, without Loss to the Workman," etc.

Mr. Henry G. Morris gave a brief description of an atmospheric elevator, consisting of a closed cage or car working in an air-tight well, the air pressure, supplied by a "Root" or other pressure blower, being admitted to the top or bottom of the cage, in descending or ascending. The doors at the different stories opening inward, the pressure of air keeps them closed until the interior of the car is brought opposite, when, the pressure being relieved, the door can be opened into the car. The car being counterbalanced, only a comparatively slight pressure of air, equal to a water column of 6 to 8 in. only, is required to move an average load on a car 6 ft. square. The escape of air beneath the car being at all times readily controlled by the attendant, it is impossible for the car to descend at a dangerous speed, and other obvious features render this form of elevator comparatively safe.

Mr. Henry G. Morris also exhibited a sample of seamless copper tube which had been compressed endwise under a steam hammer, and showed peculiar foldings of the metal into overlapping equilateral triangles forming an interior hexagonal section. The absence of fractures showed great purity of material.

Mr. John T. Boyd described a new design for parlor cars for the Pennsylvania Railroad.

The Secretary presented, for Mr. Edward Parrish, an illustrated description of Powers' disinfecting tank and automatic Siphon.

The Secretary presented for the Reference Book, a table which he had prepared of vulgar fractions of 1 in. reduced to *exact* decimals of 1 in.

Mr. Wm. L. Simpson exhibited a remarkably perfect casting of a toad, the pattern used being the toad himself.

ELECTIONS AND APPOINTMENTS.

Alabama Great Southern.—At the annual meeting of the English company in London, March 25, the following directors were chosen: Lawrence J. Baker, George W. Medley, Charles Schiff, F. L. Slous.

Allegheny Valley.—Mr. William A. Wood has been appointed Master Mechanic of this road, dating from April 14, 1884. His office will be at Verona Shops. Mr. Wood succeeds Mr. G. W. Glass, deceased.

Ashtabula & Pittsburgh.—This company has elected John N. Hutchinson President; Frank Semple Secretary and Treasurer. The road is leased to the Pennsylvania Company.

Chicago, St. Louis & Pittsburgh.—The following circular from this company is dated Pittsburgh, April 4:

"At the first meeting of the board of directors of the consolidated company known as the Chicago, St. Louis & Pittsburgh Railroad Co. held in Philadelphia on April 3, 1884, the following officers were elected: G. B. Roberts, President; J. N. McCullough, First Vice-President; William Thaw, Second Vice-President; Thomas D. Messler, Third Vice-President and Comptroller; John W. Renner, Assistant Comptroller; J. T. Brooks, General Counsel; J. J. Brooks, Assistant Counsel; John E. Davidson, Treasurer; M. C. Spencer, Assistant Treasurer; S. B. Ligget, Secretary; A. A. Stull, Assistant Secretary; James McCrea, Manager; John F. Miller, Superintendent Eastern Division; Charles Watts, Superintendent Western Division; M. J. Becker, Chief Engineer; E. B. Wall, Superintendent of Motive Power; S. H. Church, Superintendent of Transportation; William Mullins, Purchasing Agent; Albert McElevey, Auditor: John C. Suee, Paymaster; William Stewart, General Freight Agent; F. H. Kingsbury, Assistant General Freight Agent; D. T. McCabe, General Western and Division Freight Agent; E. A. Ford, General Passenger and Ticket Agent; Charles O. Scull, Chief Assistant General Passenger Agent.

"The other officers and employés of the Chicago, St. Louis & Pittsburgh Railroad Co., of Indiana, were continued in their respective positions until further orders."

Chicago, Wisconsin & Northern.—This new company, at a meeting held in Waukesha, Wis., April 10, elected A. E. Perkins, President; H. M. Enos, Vice-President: T. W. Haight, Secretary: Henry P. Glover, Treasurer, and E. W. Chapin, Solicitor.

Cincinnati & Muskingum Valley.—At the annual meeting recently the following directors were chosen: James Buckingham, M. Churchill, W. A. Graham, James Herdman, Thomas D. Messler, Charles Moran, George B. Roberts. The board elected Thomas D. Messler, President; W. F. Black, Secretary and Treasurer. The road is leased to the Pittsburgh, Cincinnati & St. Louis.

Cincinnati, Wabash & Michigan.—This company has re-elected the old officers, as follows: President, J. H. Wade; Vice-President, W. Bingham; General Manager, Norman Beckley; Secretary and Treasurer, W. S. Jones.

Dakota Midland.—The following circular from the President's office is dated Ellendale, Dak., March 28:

"The banking firm of Foster, Stewart & Habicht, of No. 6 Wall street, New York city, having been appointed, and they having accepted the position of Financial Agents of this company, on and after this date they have full power and authority as such Financial Agents to do and perform all the duties of their official position for and on behalf of this company, and have full supervision and authority over their said department, and will be recognized accordingly."

Florida Railway & Navigation Co.—The directors of this consolidated company have elected Mr. B. S. Henning President.

International & Great Northern.—At the annual meeting recently the following directors were elected: Jay Gould, R. S. Hayes, A. L. Hopkins, Samuel Sloan, James A. Baker, Ira H. Evans, Fred Rice, W. R. Maxwell, Russell Harding. The officers chosen were: Jay Gould, President; R. S. Hayes, First Vice-President; A. L. Hopkins, Second Vice-President; D. S. H. Smith, Secretary and Treasurer; W. R. Maxwell, Assistant Secretary; H. B. Henson, Assistant Treasurer.

Memphis & Little Rock.—Mr. Rudolph Fink has been appointed Receiver. He was formerly General Manager of the road, but more recently General Manager of the Mexican Central.

Memphis, Oxford & Columbus—The officers of this new company are: President, J. A. Orr, Columbus, Miss.; Vice-President, J. T. Ferguson, Memphis, Tenn.; Secretary, Bern Price, Oxford, Miss.

Mexican Central.—The following circulars from General Manager D. B. Robinson are dated Mexico, April 7:

"Mr. D. Mackenzie has this day been appointed General Superintendent, with headquarters in the city of Mexico."

"Mr. F. W. Johnstone has this day been appointed Superintendent Motive Power and Machinery, with headquarters in the city of Mexico."

"The following reorganization of the operating department of this road will take effect this date: The road will be operated in four divisions, viz.:

"First Division, Mexico to south switch at Silao, 383 kilometers, in charge of G. T. Jarvis, Superintendent, with headquarters in the city of Mexico.

"Second Division, Silao to south switch at Calera, including Guanajuato Branch, 376 kilometers, in charge of J. H. Smith, Superintendent, with headquarters at Silas.

"Third Division, Calera to south switch at Santa Rosalia, 710 kilometers, in charge of William Davis, Superintendent, with headquarters at Jimulco.

"Fourth Division, Santa Rosalia to Paso Del Norte, 524 kilometers, in charge of R. E. Comfort, Superintendent, with headquarters at Paso Del Norte.

"Train orders will be given in name of division superintendents."

The following circular was issued on March 20:

"Mr. Charles F. West has this day been appointed Superintendent of Telegraph of the entire main line, with headquarters at Aguascalientes. He will have charge of the construction and maintenance of the line, of all matters pertaining to the commercial telegraph business (excepting the accounts, which will pass through the Auditing Department as at present), employ all operators, with the exception of those who act as agent as well as operator, who will be under the supervision of division superintendents. All requisitions for telegraph supplies and material must be approved by him before they can be filled by the General Material Agent."

Morgan's Louisiana & Texas.—At the annual meeting in New Orleans, April 8, the following directors were chosen: C. P. Huntington, A. C. Hutchinson, J. G. Schriever, George Pandely, John B. Richardson. The directors elected the following officers: President, A. C. Hutchinson; Vice-President, J. G. Schriever; Secretary and Treasurer, John B. Richardson.

New York Central & Hudson River.—At the annual meeting in Albany, April 16, the following directors were chosen: Sherman S. Jewett, Buffalo, N. Y.; Wm. Bliss, Boston; Samuel F. Barger, Charles C. Clarke, Chauncey M. Depew, Cyrus W. Field, H. J. Hayden, J. Pierpont Morgan, James H. Rutter, Cornelius Vanderbilt, Frederick W. Vanderbilt, Wm. K. Vanderbilt, Wm. H. Vanderbilt, New York.

The directors who were not in the board chosen a year ago are Messrs. Jewett, Bliss, Clarke and Hayden, who replace Chester W. Chapin, James M. Marvin, John Allen, Jr., and Augustus Schell, deceased. Messrs. Clarke and Hayden are vice-presidents of the company; Mr. Bliss is President of the Boston & Albany.

New York Central Sleeping Car Co.—Mr. James Tillinghast has been chosen President in place of Augustus Schell, deceased.

New York, Pennsylvania & Ohio.—At a meeting held in London recently the first and second-mortgage bondholders re-elected the old voting trustees, as follows: Sir George Balfour, Rev. J. Lockington Bates, Rt. Hon. H. C. Raikes and C. E. Lewis.

Northern, of New Jersey.—At the annual meeting recently the following directors were chosen: Wm. C. Browning, J. H. Browning, A. S. Diven, A. A. Hardenberg, J. W. McCulloh, H. G. Marquand, O. A. Rourbach, O. A. Sisson, S. Zabriskie. The road is leased to the Erie.

Northern Pacific.—Mr. A. D. Edgar has been appointed General Eastern Agent, with office in New York, in place of J. M. Moorhead, resigned. Mr. Edgar has been General Agent for the company in Chicago for several years.

Pennsylvania Railroad Leased Lines.—At meetings held recently directors were chosen as below by the companies named, whose roads are leased to the Pennsylvania Railroad Co.: *Bald Eagle Valley.*—President, L. A. Mackey; Directors, Edmond Blanchard, A. G. Curtin, J. N. DuBarry, James Duffy, James M. Gamble, John P. Green, John Irwin, Jr., C. A. Mayer, Wistar Morris, Henry M. Phillips, George B. Roberts, Edmund Smith. *Philadelphia & Long Branch.*—President, W. H Wilson; Directors, I. S. Buckelew, A. L. Dennis, G. M. Dorrance, H. B. Ely, F. Wolcott Jackson, Lewis Perrine, W. J. Sewell, Edmund Smith, N. Parker Shortridge, C. B. Thurston, H. D. Welsh, J. P. Wetherill; Secretary, James R. McClure; Treasurer, Wm. Taylor.

Pittsburgh, Cincinnati & St. Louis.—The new board has re-elected the old officers of the company as follows: President, G. B. Roberts; First Vice-President, J. N McCullough; Second Vice-President, Wm. Thaw; Third Vice-President and Comptroller, Thomas D. Messler; Secretary, S. B. Liggett; Assistant Secretary, Stephen W. White; Treasurer, John E. Davidson; Assistant Treasurer, M. C. Spencer.

Portland & Ogdensburg.—The following circular was issued April 1 by Mr. S. J. Anderson, Receiver of this road:

"The undersigned having been appointed Receiver of the Portland & Ogdensburg Railroad Co., by decree of the Supreme Court of the state of Maine, March 24, 1884, this day assumes possession of the property, and enters upon the discharge of his duties as Receiver of the said company.

"The following named general officers are appointed: Jonas Hamilton, Superintendent; John W. Dana, Cashier; Charles H. Foye, General Ticket Agent and Auditor of Receipts; Walter Tolman, General Freight Agent; John F. Anderson, Chief Engineer."

Rochester & Pittsburgh.—Mr. Henry Ware has been appointed Road-Master of the Rochester Division. He has been connected with the New York & New England road for seven years past.

St. Paul & St. Croix.—The directors of this new company are: Brigham Bliss, Edwin A. Jaggard, Wm. H. Lightner, Henry B. Wenzell, St. Paul, Minn.; Howard Morris, Milwaukee.

Wabash, St. Louis & Pacific.—At a meeting of the board held in New York, April 14, Messrs. James F. Joy, George L. Dunlap and George J. Gould were added to the Executive Committee.

PERSONAL.

—Mr. J. M. Moorhead has resigned his position as General Eastern Agent of the Northern Pacific road.

—Mr. Richard Archdeacon, Master of Transportation of the Texas & St. Louis road, died at Waco, Tex., April 4, of consumption. His remains were sent to Ohio, from which State he went to Texas.

—Mr. W. A. Strong has resigned his position as Assistant General Passenger Agent on the Chicago, Rock Island and Pacific Road, to take effect May 1. Mr. Strong resigns entirely for personal reasons and will, it is understood, go into other business.

—Mr. J. L. Folsom has accepted a position in the Eames Vacuum Brake Co., at Watertown, N. Y. Mr. Folsom was for a number of years Master Mechanic of the Boston, Revere Beach & Lynn road, and his resignation of that office was recently noted.

—Mr. John Crowe, Auditor of the Northern Central Railroad Co., died in Baltimore April 12. He had been in the employment of the company for over 30 years, entering when a young man and rising gradually to be Auditor. He was also Secretary of the Baltimore & Potomac Co. He had been in failing health for some time.

—Mr. Geo. E. Leete, President of the Providence & Worcester Railroad Company died at Providence, R. I., April 12, aged 67 years. Mr. Leete was well known as a business man in Providence and had been for 35 years in charge of the Duncan estate. He had been a director of the Providence & Worcester for 10 years past and President since 1878.

—Mr. Geo. A. Sanderson has resigned his position as General Freight and Passenger Agent of the Toledo, Cincinnati & St. Louis road, to take effect April 30. Mr. Sanderson has worked very hard for this road and now resigns, feeling that he is not doing himself justice in continuing the hopeless struggle which is necessary in the present condition of the line.

—Mr. H. C. Atkins, Assistant Superintendent of the Chicago, Milwaukee & St. Paul road, was stricken with paralysis at La Crosse, Wis., April 11; he never rallied, but died April 15. Mr. Atkins had been connected with the St. Paul road in various capacities for a number of years, and was one of its most trusted officers. It is said that the paralytic stroke which killed him was the result of overwork and mental anxiety.

—The Aurora (Ill.) *Beacon* in chronicling the appointment of Charles H. Chappell to be General Manager of the Chicago & Alton Railroad, says: "There are not a few of our people who remember Mr. Chappell when he was an enterprising, active and attentive brakeman on the Chicago, Burlington & Quincy Railroad, whose general air of business betokened the great prosperity and unusually quick promotion which was to follow him as a railroad man."

—Dr. W. D. Barnard has tendered his resignation as Secretary of the Baltimore & Ohio Employés' Relief Association, on account of failing health. Dr. Barnard has been Secretary of the Association since it was first organized, and to his hard and faithful work is largely owing its success. He recently took a trip to Arizona for the benefit of his health, but on his return experienced a renewal of his former trouble. He contemplates going to Arizona to live.

—Mr. George W. Glass, Master Mechanic of the Allegheny Valley road, died April 10, at his home at Parnassus, Pa., aged 64 years. Mr. Glass was for a number of years in the Pittsburgh, Fort Wayne & Chicago shops; he was made Master Mechanic of the Allegheny Valley road when it was first built some 25 years ago, and has held the position ever since. He was widely known and much respected. Mr. Glass was formerly an active member of the Master Mechanics' Association.

—Col. C. G. Hammond, one of the oldest and most respected citizens of Chicago, died suddenly in that city April 15, aged 80 years. Col. Hammond was prominent in connection with the earlier railroads of Chicago, and was for a number of years General Superintendent of the Chicago, Burlington & Quincy road. He left that road in 1865, and was, some years afterward, General Superintendent of the Union Pacific for a time, succeeding Mr. Webster Snyder. Since leaving that road Col. Hammond has retired from active work.

TRAFFIC AND EARNINGS.

Cotton.

Cotton movement for the week ending April 11 is reported as follows, in bales:

	1884.	1883.	Inc. or Dec.	P. c.
Interior markets:				
Receipts	28,389	28,341	I. 48	0.2
Shipments	43,715	46,032	D. 2,317	5.0
Stock, April 11	110,068	239,461	D. 129,393	53.9
Seaports:				
Receipts	30,113	72,935	D. 42,822	58 7
Exports	51,630	99,480	D. 47,850	48.0
Stock, April 11	631,515	769,570	D. 138,055	18.9

The total amount of cotton in sight, or actual shipments from plantations for the cotton year (from Sept. 1) to April 11 was 5,473,014 bales, a decrease of 1,048,424 bales, or 16.1 per cent., from last year.

Boston Traffic Notes.

In March the Boston & Albany received from the New York Central at Albany 12,320 freight cars, and 8,078 passed Worcester bound east.

Rates on Illinois Coal to Missouri River Points.

Commission Midgley, of the Southwestern Railroad Association, has issued a circular authorizing a special rate of $2 per long ton from Mississippi River points to Kansas City, Leavenworth, Atchison and St. Joseph on soft coal mined in Illinois. This rate is confined strictly to Illinois coal, and is conditional upon the business being sent by such line or lines as the association may direct.

Railroad Earnings.

Earnings for various periods are reported as follows:

	1884.	1883.	Inc. or Dec.	P c.
Three months ending March 31:				
Bur., C. R. & No.	$633,176	$637,317	D. $4,141	0.6
Central Pacific	4,591,000	5,238,166	D. 647,166	12.3
Cin., Ind., St. L. & Chi	509,500	559,522	D. 50,022	8 8
Cin., W. & Balt.	404,043	439.961	D. 35,918	8.2
Cleve., Ak. & C.	100,528	118,963	D. 18,435	15.5
Ev. & Terre H.	153,031	169,145	D. 16,114	9.5
Grand Trunk	3,910.734	4,319,779	D. 409,045	9.5
G. B., W. & St. P.	86,136	85,129	I. 1,007	1.2
Gulf, Col. & S. F.	398,796	436,709	D. 37.913	8.7
Ill. Central	2,445,700	2,759.090	D. 313,390	11.4
Iowa lines	395,500	453.699	D. 58,199	12 8
Ind., Bloom. & W.	633,865	719,375	D. 86,010	11.9
Kansas City, Ft. Scott & Gulf	579,978	472,505	I. 107,473	22.7
Kan. City, Spr. & Mem	200,043			
Mobile & Ohio	539,584	569,301	D. 29,715	5.2
Net earnings	154,584	152,150	I. 2,434	1.6
Norfolk & West.	651,494	594,990	I. 56,504	9 5
Shenandoah V.	170,439	145,765	I. 24,674	17.0
St. L., Al. & T. H.:				
Main Line	371,425	393.952	D. 22,527	5.7
Belleville Line	201,147	216,409	D. 15,262	7.0
St. L., Ft. Scott & Wichita	122,192	41,383	I. 80,809	195 2
St. P., M. & Man.	1,556,534	1,609,189	D. 52,655	3.3
Wis. Central	367,311	316,463	I. 50,848	16.1
Two months ending Feb. 29:				
Atch., T. & S. F.	$2,339,367	$2,09[illegible],328	I $240,039	11.4
Net earnings	1,186,360	846,037	I. 340,323	40.2
Bur., C. R. & No.	415,827	384,404	I. 31,423	8.2
Net earnings	114,829	59,982	I. 54,847	91.4
Denver & R. G.	879,071	921,257	D. 42,226	6.4
Net earnings	106,793	257,149	D. 150,356	58.5
Des M. & Ft. D.	53,699	41,591	I. 12,108	29.0
Net earnings	16,130	5,427	I. 10,703	198.2
Flint & Pere M.	376,381	355,133	I. 21,248	6.0
Net earnings	112,507	76,833	I. 35,674	46.3
Louisv. & Nash.	2,054,748	2,133,542	D. 78,794	3.7
Net earnings	605,746	726,345	D. 120,599	16 6
N. Y. & N. Eng.	499,278	483,392	I. 15,886	3.3
Net earnings	60,078	*35 840		
Oregon & Cal	137,491	139,790	D. 2,299	1.6
Union Pacific	3,086,876	3,590,078	D. 503,202	14.0
Net earnings	580,494	1,563,502	D. 983.008	69.2
Utah Central	150,716	198,061	D. 47,345	23.9
Net earnings	47,091	102,374	D. 55,283	54.2
Month of February:				
Atch., T. & S. F.	$1,167,020	$1,033,534	I. $133.486	12.9
Net earnings	583,076	429,962	I. 153,114	35.6
Bur., C. R. & N.	201,964	187,001	I. 14,963	8.0
Net earnings	54,679	42,245	I. 12.434	29.6
Denver & R. G.	391,780	457,534	D. 65,754	19 3
Net earnings	34.568	138,540	D. 103,972	75.0
Des M. & Ft. D.	27,215	21,573	I. 5,642	26.1
Net earnings	8,959	4,134	I. 4,825	118.5
Flint & Pere M.	189,589	164,954	I. 24,635	14.9
Net earnings	58,322	32,677	I. 25,645	78.0
Louisv. & Nash.	1,015,431	1,014.807	I. 624	0.1
Net earnings	302.304	322,890	D. 20,586	6.4
N. Y. & N. Eng.	252,513	237,711	I. 14,802	6.2
Net earnings	39,354	*6,734		
Oregon & Cal.	61,997	57,390	I. 4,607	8.1
Net earnings	11,153			
Shenandoah Vy.	58,505	46,812	I. 11,693	25.3
Net earnings	3,305	*2,574		
Union Pacific	1,547,968	1,673,224	D. 125,256	7.5
Net earnings	346,950	665,770	D. 318,820	47.9
Utah Central	75,433	98,880	D. 23,447	23.7
Net earnings	22,804	53,748	D. 30,944	57.3
Month of March:				
Bur., C. R. & N.	$217,349	$252,913	D. 35.564	14.1
Central Pacific	1,624,000	2,024,533	D. 400,533	19.8
Cin., Ind., St. L. & Chi	205,467	226.484	D. 21,017	9.3
Cin., W. & Balt.	164,101	164.748	D. 647	0.4
Cleve., Ak. & C	39.124	47,467	D. 8.343	17.7
Ev. & Terre H.	65,242	68,911	D. 3,669	5.3
Grand Trunk	1,217,242	1,380,821	D. 163.579	11.4
G. B., W. & St. P.	31,578	39,105	D. 7,527	19.3
Gulf, Col. & S. F.	124,042	141,194	D. 17.062	12.1
Ill. Central	852,800	931,934	D. 79,134	8.6
Iowa lines	140,500	204.933	D. 64.433	31.4
In., Bloom. & W.	222,349	268,801	D. 46,452	17.2
Kansas City, Fort Scott & Gulf	199,365	174,432	I. 24,933	14.3
Kan. City, Spr. & Mem	65,317			
Mobile & Ohio	188,899	184,844	I. 4,055	2.2
Net earnings	63,899	48,461	I. 15,438	32.1
Norfolk & West.	213,117	203,158	I. 9,959	4.9
Shenandoah V.	55,795	57,055	D. 1,260	2.4
St. L., Alt. & T. H.:				
Main Line	129,409	133,093	D. 3,684	2.8
Belleville Line	73,041	80,951	D. 7,910	9.9
St. L., Ft. Scott & Wichita	45,907	17,990	I. 27,917	155.1
St. P., M. & Man.	700,100	729,813	D. 29,713	4.1
Wis. Central	138,516	135,701	I. 2,815	2.1
First week in April:				
Canadian Pacific	$87,000	$87,000		
Chi. & Alton	138,413	137,085	I. 1,328	1.0
Chi. & East. Ill.	26,929	28,849	D. 1,920	6.6
Chi., Mil. & St. P.	491,000	463,202	I. 27,798	6.0
Chi. & Nor'west.	426,200	428,000	D. 1,800	0.4
Chi., St. Paul, M. & Omaha	129,000	108,900	I. 20.100	18.4
Det., Lan. & No.	26,849	28,690	D. 1,841	6.4
E. Ten., Va. & G.	71,295	69,948	I. 1,347	1.7
Long Island	51,839	48,510	I. 3,329	6.8
Louisv. & Nash.	257,790	233,835	I. 23,955	10.2
Mil. & Northern.	10,910	10,635	I. 275	2.5
No. Pacific.	317,600	172,100	I. 145,500	84.6
Peoria, Dec. & E.	12,987	13,560	D. 573	4.2
Roch. & Pitts	17,263	7,328	I. 9,935	135.6
St. L. & San F.	86,000	65,200	I. 20,800	32.0
St. P. & Duluth	18,227	17,722	I. 565	2.9

* Deficit.

Weekly earnings are usually estimated in part, and are subject to correction by later statements.

Grain Movement.

For the week ending April 5 receipts and shipments of grain of all kinds at the eight reporting Northwestern markets and receipts at the eight Atlantic ports have been, in bushels, for the past eight years:

Year.	Northwestern receipts.	Northwestern shipments. Total.	By rail.	P. c. By rail.	Atlantic. receipts.
1877	1,958,962	1,778,463			2,430,109
1878	3,997,045	3,174,725	962,520	29.2	3,937,425
1879	2,566,299	3,076,437			4,629,678
1880	3,486,821	7,730,317	1,678,295	21.8	5,371,029
1881	3,643,139	2,727,023	2,358,221	86.6	3,318,477
1882	3,394,348	2,911,494	1,394,952	47.9	976,229
1883	3,651,234	2,251,783	1,912,888	85.0	2,696,108
1884	3,318,127	4,344,131	4,159,097	95.7	2,887,282

Thus the receipts of the Northwestern markets for the week this year were smaller than in the corresponding week of any other year since 1879 and 333,000 bushels less than last year. They were also 853,000 less than in the previous week of this year, and the smallest receipts since last May. This decrease is probably partly due to the fall in the price of wheat, but chiefly, perhaps, to the opening of spring, which keeps the farmers in the field. The only great change in price has been in wheat, and this forms comparatively a small part of the receipts, and while, from the week ending March 29 to that ending April 5, the decrease in wheat receipts was 26.510 bushels (5 per cent.), the decrease in corn receipts was 563,772 bushels (28 per cent.); and even in oats and barley the decrease was greater than in wheat.

The shipments of these markets this year, on the other hand, were 2,092,000 bushels (93 per cent.) more than last year, and more than in the corresponding week of any previous year except 1880, when in this week the Chicago and Milwaukee fleets started down with more than 6,000,000 bushels of grain. The shipments were also larger than in any previous week since navigation closed last November, but only 138,000 bushels more than in the week next previous. In the last week 185,034 bushels of the shipments went down the Mississippi.

The receipts of the Atlantic ports for the week were 191,000 more this year than last, and nearly three times as great as the excessively small ones in 1882, but much less than in any of the four years from 1878 to 1881. They were but 64,000 bushels more than in the previous week of this year, and show very slightly the effect of the low rates and prices, which have increased the Northwestern shipments enormously.

The exports from Atlantic ports for this week ending April 5 have been for five years:

	1880.	1881.	1882.	1883.	1884.
Flour, bbls.	107,773	144,720	124,059	155,269	102,005
Grain, bu.	4,155,301	4,055,541	1,017.120	2,963,192	1,261,068

Thus the exports this year were but half as great as last, and but a trifle more than in 1882, while they were not one-third great as as in 1880 and 1881.

San Francisco exports for the ten months of the California crop year from July 1 to April 1 were as follows, flour in barrels and wheat in bushels, flour being reduced to wheat in the totals:

	1883-84.	1882-83.	Inc. or Dec.	P. c.
Flour	977 937	813,591	I. 164,346	20.2
Wheat	16,899.387	22,276,605	D. 5.377,218	24 1
Total, bush.	21,789,072	26,344,560	D. 4,555,488	17.3

Exports of California barley by sea for the ten months to April 1 were 172,754 centals, a decrease of 22,143 centals, or 11.3 per cent.

Coal.

Coal tonnages for the week ending April 5 are reported as follows:

	1884.	1883.	Inc. or Dec.	P. c.
Anthracite	751,344	377,989	I. 373,355	98.8
Eastern bituminous	165,381	175,893	D. 10,512	6.0
Coke	64,430	52,081	I. 12,349	23.7

The anthracite production is for a week of full time this year, compared with half time last year. The anthracite companies have agreed to suspend production for the entire week ending April 19. This will take out nearly 700,000 tons, and suspensions will be continued until tidewater stocks are brought down to a level with demand.

The coal tonnage of the Pennsylvania Railroad for the week ending April 5 was:

	Coal.	Coke.	Total.
Line of road	127,673	55,638	183,311
From other lines	71,415	5,792	77,207
Total	199.088	61.430	260,518

The total tonnage this year to April 5 was 3,322,640 tons, against 3,225,979 tons to the corresponding date last year; an increase of 96,661 tons, or 3.0 per cent.

The anthracite tonnage of the Belvidere Division, Pennsylvania Railroad, for the week ending April 12 was 43,353 tons. The total tonnage this year to April 12 was 450,578 tons, a decrease from last year of 57,597 tons, or 12.7 per cent.

San Francisco coal receipts for March were 71,387 tons, against 69,900 tons for March, 1883, an increase of 1,487 tons, or 2.1 per cent.

The St. Louis *Republican* says: "A gentleman well informed upon the subject, who has recently made a tour of the Indian territory, returned to St. Louis yesterday, and registered at the Hotel Hunt. A reporter of the *Republican* met him last evening, and obtained some interesting facts. He says the Missouri Pacific Railway Co. is making extensive arrangements for developing large fields of coal in the Indian territory. This company is now mining within the limits of the Choctaw Nation at the rate of a quarter of a million tons per annum. The coal is of a very superior quality, bearing analogy to Cumberland, Briar Hill and Pittsburgh, equally good for all purposes to which bituminous coal can be applied, carrying a high percentage of carbon and a small percentage of ash and sulphur. The Missouri Pacific Co. is extensively prospecting large fields lying easterly from McAllister and Savannah in the Choctaw country, and is meeting with the most encouraging results in finding a clean vein of coal averaging 4 ft. in thickness, and in some localities two veins as good in all respects as those now being mined at McAllister or Savannah. Within a year the output of coal in the Choctaw Nation will be at least half a million tons."

Mr. John H. Jones, Official Accountant, furnishes the following statement showing general distribution of entire production of anthracite coal for year ending Dec. 31, 1883:

	Tons.	P. c.
To Pennsylvania, New York and New Jersey	21,830,504	68.6
To New England states	5,387,700	16.9
To Western United States	2,537,174	8.0
To Southern states, including Delaware, Maryland and the District of Columbia	1,284,093	4.0
To Pacific Coast	24,635	0.1
To Dominion of Canada	690,498	2.3
To foreign ports	38.423	0.1
Total	31,793,027	100.0

Cumberland coal shipments for the week ending April 12 were 63,851 tons. The total shipments this year to April 12 were 568,604 tons, against 546,239 tons to the corresponding date last year, an increase of 22,365 tons, or 4.1 per cent.

The Union Pacific and Burlington Settlement.

A meeting of the conference committees of the Union Pacific and the Chicago, Burlington & Quincy companies was held in Boston, April 13, General Manager Clark of the Union Pacific being also present. It is reported that at this meeting the first definite step was taken toward a settlement of the difficulties between the companies. The Burlington Co. has agreed to waive its claim for a full share in the Union Pacific business at Omaha, and will allow the Union Pacific to deliver its share of the Nebraska business to the roads which joined in the tri-partite agreement, the Iowa lines to decide what share the Burlington road shall have. Only the Nebraska business was considered but it is said that the same principle will be applied to the Colorado and Utah business. It is thought that the prospect of a final adjustment is now very fair. After a settlement has been made for the divi-

sion of the business of the Iowa lines the questions of local pools on the Nebraska, Colorado and Utah business will have to be adjusted.

RAILROAD LAW.

Railroad Co. and Municipal Ordinances.

In the case of the Mayor, etc., of Athens against the Georgia Railroad Co., the Georgia Supreme Court has just decided as follows: The municipal authorities of the city of Athens passed an ordinance that "no person or persons shall be allowed to store any guano or commercial fertilizer at any point within the corporate limits of the city of Athens without first obtaining the consent of the Mayor and Council." At that time the Georgia Railroad had within the city of Athens, on the east side of the Oconee River, a depot and a building for the storage of commercial fertilizers, in which they were then stored. Subsequently the railroad company abandoned this depot and building, and moved across the river nearer the centre of the city, and at great expense erected other depot buildings and a house wherein it stored commercial fertilizers for their consignees. No objection was made to this by the municipal authorities; but subsequently they fined the railroad agent and threatened further punishment both to him and the consignees:

Held, 1. That the ordinance does not apply to the railroad company. The company is bound to deliver at Athens all articles of merchandise, including commercial fertilizers, which it received for that purpose; it is bound to take due care of all such articles while in its possession and before delivery to the consignees, and to that end may erect storehouses for the safe keeping of all such goods as it cannot deliver immediately. The municipal authorities having seen the company move its depot and proceed to erect buildings, without objection or warning that it would not be allowed to store fertilizers there, are now estopped from asserting the ordinance against the company.

Whether the ordinance is probibitory and in restraint of trade and therefore contrary to public policy and void, is not decided.

2. The act of Dec. 21, 1833, authorizing the Georgia Railroad Co. to purchase all lands contiguous thereto "that may be found necessary for the erecting toll-houses, storehouses, workshops, barns, etc.," invested that company with the right to purchase land and erect store-houses in the city of Athens, and to store therein such merchandise, commercial fertilizers and other freight as was necessary for its preservation and security, and the city of Athens has no power under its municipal authority to declare such storehouses so erected and stored with freight nuisances, or to abate the same, or to punish the company or its servants or agents for such storage.

Judgment affirmed.

OLD AND NEW ROADS.

Atchison, Topeka & Santa Fe.—This company makes the following statement for February and the two months ending Feb. 29, including the Southern Kansas lines:

	February.		Two months.	
	1884	1883.	1884.	1883.
Earnings	$1,167.020	$1,033,554	$2,339,368	$2,099,328
Expenses	583,944	603.572	1,153,007	1,253,291
Net earnings	$583,076	$429,962	$1,186,361	$846.037
Per cent. of exps.	49.9	58.4	48.4	59.7

The mileage worked for February was 2,315 in 1884 and 2,219 in 1883; for the two months, 2,287 miles in 1884, and 2,219 miles in 1883. For the two months there was an increase of $240,040, or 11.4 per cent., in gross earnings; a decrease of $100,284, or 8.0 per cent., in expenses, and a resulting gain in net earnings of $340,324, or 40.2 per cent.

Atlanta & Baltimore.—A report comes from Savannah that a new road is to be built in an air line from Atlanta to Baltimore. The report as telegraphed seems exceedingly doubtful, its statements being altogether too loose. It says first, that the proposed line will be 200 miles shorter than the most direct line, which is, on the face of it, impossible. Second, that it can be easily and cheaply constructed, which is also impossible, when it is remembered that such a line must run nearly all the way through the roughest of the mountain country of the Carolinas and Virginia. Third, that the road will be built or backed by the Central Railroad Co., of Georgia; that company is an enterprising one, but is not given to throwing money away on impossible projects. There are some minor inconsistencies, such as a proposed use of part of the Western North Carolina road, which the Richmond & Danville is not likely to give to a competing line.

The fact is that no new line could be built from Atlanta to Baltimore which could shorten the distance materially. Even a moderate saving in mileage could only be secured by building an extremely expensive road. Such a line, if built, could secure very little local traffic, and the through business for which it would compete is already subject to more division than it can well bear. Furthermore, this traffic grows but slowly, and it will be a good while yet before there will be enough of it to warrant the building of a new and costly parallel line to fight for a share of it. There is more contest now than is agreeable to the carriers.

Baltimore & Ohio.—At the regular monthly meeting of the board in Baltimore last week the Finance Committee presented its report for the half-year ending March 31, and on its recommendation the usual cash dividend of 5 per cent., was declared for the half year. The report shows that after the payment of the dividend there will remain over $500,000 to be added to the surplus fund.

Boston & Albany.—Arrangements have been completed for running dining cars on the through trains between Boston and New York by way of Springfield. These cars will be put on as soon as they can be gotten ready, which will probably be early in June. The train leaving Boston at 11 a. m. will have a dining car attached when it reaches Worcester, the car to go as far as New Haven; and, returning, the car will be attached to the train leaving New York at 4:40 p. m., and taken back to Worcester. Going east, the train leaving New York at 11 a. m. will carry the dining car from New Haven to Worcester and the car will return on the afternoon train from Boston to New York.

Boston Elevated.—A meeting of the incorporators of the Boston Elevated Railroad was held last week, when a temporary organization of the company was effected. After a general discussion of the charter it was resolved to form a company and to sign and file articles of incorporation. The charter which was recently passed by the Legislature provides that the company shall be considered a street railroad company and must comply in its organization with the general law regulating such companies. The first section is to be 1¼ miles in length, from Bowdoin square, in Boston, to some point in Cambridge. The route has not yet been decided upon, but must be approved by the Aldermen of Cambridge and Boston. The charter provides that the road shall be built after the single-rail plan of Joseph V. Meigs, and gives the company authority to take necessary lands in the same manner as steam railroad companies, and also requires it to pay to owners of abutting property, such damages to be determined in the manner now provided by law. Further extensions of the road are contingent upon the success of the first section and on permission to be obtained from the city authorities.

The incorporators have decided to fix the stock at $200,000 per mile, and books will shortly be opened for subscription to the stock in Boston.

Burlington, Cedar Rapids & Northern.—This company has let a contract for grading 50 miles of the extension of its road from Spirit Lake, Ia., northwest, to E. P. Reynolds & Co., of Dubuque, Ia. This extension is intended to run northwest to Bismarck.

Canadian Railroad Subsidies.—The Lower House of the Canadian Parliament has passed a resolution granting subsidies to the following railroads and railroad companies:

To the Quebec Government for the North Shore road from Quebec to Montreal, $6,000 per mile, or $954,000.

To the Quebec Government for the North Shore Railroad, from Montreal to Quebec, $12.000 per mile, or $744,000.

For a line from Montreal to Halifax and St. John by the shortest possible route, $170,000 a year for 15 years.

For the construction of a line from Oxford Station on the Intercolonial road to Sydney and Louisburg, on Cape Breton, $30,000 a year for 15 years.

To the Quebec Central for a line from Beauce Junction to the United States line, $211,200.

For the extension of the Canadian Pacific from St. Martin Junction, near Montreal, to Quebec, $960,000.

For a line from the Midland road to Bancroft, Ont., $160,000.

To the Pacific Junction road from Aylmer to Pembroke, $270,000.

To the Gatineau Valley Railroad from Razibazua to Lake Desert, $160,000.

To the Napanee, Tamworth & Quebec road, for a branch to Bridgewater, $70,400.

To the Montreal & Western, for a line from Lake Simon to Lake Desert, $160,000.

To the Miramichi Valley road from Fredericton, N. B., to the Miramichi River, $128,000.

To the Erie & Huron road from Morrisburg, Ont., to Sarnia, $96,000.

To the Ontario & Pacific road from Cornwall to Perth, $262 500.

To the Kingston & Pembroke road, from Mississippi to Renfrew, $48,000.

To the Great Northern road, from St. Jerome, Quebec, to New Glasgow, $32.000.

For a bridge and connecting track from the Jacques Cartier Union road to St. Martin Junction, $200,000.

For a line from Richibucto, N. B., to St. Louis, $22 400.

For a road from Hopewell to Alma. N. B., $51,200.

For a road from St. Andrews to Lachute, Quebec, $22,400.

For a road from Grand Piles, Quebec, to Lake Des Isles, $217,500.

For the extension of the Western Counties road from Digby, N. S., to Annapolis, $64,000.

For a branch of the Central road from Grand Lake to the Intercolonial road near Sussex, N. B., $128,000.

For a line from Caraquet to Shippegan, N. B., $76,000.

For a branch on the Intercolonial from Derby, N. B., to Indiantown, $140,000.

For a branch of the Intercolonial from Metapediac to Paspebiac, Quebec, $300,000.

Central Massachusetts.—The Boston *Advertiser*, of April 14, says: "President Aldrich is in hopes that Engineer Dwight will have completed the details necessary for starting work upon the road by May 1. This refers to the main line to Northampton.

"A survey for an outlet for the Central to Springfield, *via* Bondville and Chicopee, will soon be commenced, which, if constructed, will give the road a line from Boston to Springfield only a few miles longer than the Boston & Albany between the same points."

Central Pacific.—Work has been stopped for the present on the extension of the Oregon Division, the reason given by the company being the legislative agitation of railroad matters in California and the consequent difficulty of getting money for new construction there.

Chicago, Rock Island & Pacific.—Mr. W. H. Vanderbilt has issued a circular to the stockholders of this company, and has advertised it widely in the newspapers, requesting them to send their proxies to him for the coming election. Mr. Vanderbilt says that he has understood that the four directors whose terms expire this year are candidates for re-election, and announces his willingness to vote for the regular ticket, with the exception of Mr. H. H. Porter. In place of Mr. Porter, Mr. Vanderbilt proposes Mr. John Newell, President of the Lake Shore & Michigan Southern Co., for election as a director and will vote all proxies sent to him for Mr. Newell.

Chicago, Wisconsin & Northern.—This company, which is formed by the consolidation of organizations lately completed in Illinois and Wisconsin, proposes to build a railroad from Chicago northward to some point in Washington County, Wis., whence a separate organization will continue the line to the Lake Superior iron region.

Cincinnati, Van Wert & Michigan.—On the extension of this road from Greenville. O., southward, the grading is now completed to the crossing of the Indiana, Bloomington & Western road, a distance of six miles. Track laying is in progress and has reached the Chicago, St. Louis & Pittsburgh crossing, two miles from Greenville.

Connotton Valley.—The bondholders' committee has received an opinion from Judge Ranney, of Ohio, that the proposed plan of reorganization is in every way illegal. The committee will meet next week to complete the details of the plan,

Denver & Rio Grande.—The Utah lines of this company, at latest accounts, still remained in possession of the late General Manager, Mr. Dodge. He claims that under the terms of the lease he is entitled to continue General Manager of those lines, a clause to that effect having been inserted in the lease, which was certainly a very unusual provision. He has obtained a temporary injunction preventing his removal until a further hearing is had.

This company's statement gives the following figures for February and the two months ending Feb. 29:

	February.		Two months.	
	1884.	1883.	1884.	1883.
Earnings	$391,780	$457,534	$879 071	$921,297
Expenses	357,212	318,994	772,278	664,148
Net earnings	$34,568	$138,540	$106,793	$257,149
Per cent. of exps.	91.2	69.7	87.9	72 1
Miles of road work'd	1,679	1,437	1,679	1.437

For the two months there was a decrease of $42,226, or 4.6 per cent., in gross earnings; an increase of $108,130, or 16.3 per cent. in expenses, and a resulting decrease in net earnings of $150,356, or 58.5 per cent. Of the February earnings the statement says: "The loss on operating the Denver & Rio Grande Western Railway, being shut out of Silverton and Durango by snow slides, and the Colorado Coal & Iron troubles, had largely reduced net earnings for the month. The business is still to be done, and will show in later months. April, so far, is ahead of same time last year."

Delaware & Hudson Canal.—The canal from Honesdale to Rondout has been opened for the season. The rates on coal have been fixed at 70 cents per long ton (the distance being 108 miles), the same as last year. This is considered a low rate, and the boatmen complain that it is difficult for them to make decent wages with such pay. They also say that the stock of coal at Honesdale is very light, much smaller than is usual at this season.

Florida Railway & Navigation Co.—The branch extending from the terminus of the Peninsular Division at Wildwood, Fla., to Leesburg, on Lake Griffin, has been completed. This branch is 12 miles long, and reaches a section of country already well settled, besides giving the road a connection with a considerable section of country reached by steamboats.

Ft. Smith & Sabine Pass.—The engineers of this company have begun a survey of the road from Texarkana, Tex., northward to Ft. Smith, Ark. The line will run nearly parallel with the western boundary of Arkansas.

Kansas City, Ft. Scott & Gulf.—This company announces that all trains on its Memphis line are now running regularly with no detention whatever from any source. The company intends during the present season to so improve the road-bed and track on its new line to Memphis, that the delay of business by high water will hereafter be made almost impossible.

Lehigh Valley.—This company, as noted elsewhere, has leased the State Line & Sullivan road, which is a coal road running from Towanda, Pa., to Bernice, 27 miles. It is said that the company will build the extension of this road from Bernice to Muncy and Williamsport, for which surveys were made some time ago.

Manhattan.—In New York, April 15, Judge Van Brunt, in the Supreme Court, gave his decision in the suit brought by the Metropolitan Elevated Co. to set aside what is known as the merger agreement of Oct. 22, 1881. This action was brought by the Metropolitan Co. upon these grounds:

1. That the Metropolitan directors had no power to modify the original lease of May 20, 1879, without the consent of the stockholders.

2. Because three of the Metropolitan directors were at the time of the making of the October agreement also directors of the Manhattan Co.

3. Because the personal interests of several of the Metropolitan directors were opposed to that company.

4. Because of actual fraud charged upon part of said directors who had entered into a scheme to benefit themselves at the expense of the company.

The defendants admitted that the October agreement was not assented to by the Metropolitan stockholders, but claimed that no vote was necessary, and also claimed that the fact of the same persons being directors of both companies did not in any way invalidate the contract. They also denied that the personal interests of any of the directors were opposed to those of the company, and denied all actual fraud. The findings of Judge Van Brunt on these several points are as follows:

1. The Metropolitan directors had no power to modify the original lease of May 20, 1879, without the consent of the stockholders.

2. The October agreement was voidable because three of the Metropolitan directors were also directors of the Manhattan Co.

3. There was no actual fraud upon the part of any of the directors in making the agreements, but they were in the interests of the Metropolitan Co.

4. The October agreement was subsequently disaffirmed by the Metropolitan Co. The remaining points relate to technical legal matters and are in effect that the previous judgments in the Superior Court were no bar to the present suit and that all restitution required to be made by law can be made.

The opinion in the case is very long, the Judge citing numerous authorities in support of his rulings.

Counsel for the Manhattan Co. will take an appeal from this decision.

Manitoba & Southwestern.—This company has applied to the Canadian Government for a subsidy. It is said that the English parties who had promised to subscribe for the stock have withdrawn on account of the troubles in the Canadian Northwest.

Marietta & North Georgia.—This company has closed a contract for rails sufficient to lay the track from the present terminus of the road at Marble Grove, Ga., northward to White Path, a distance of 15 miles. A large part of the grading of this extension has been completed. This section of 15 miles includes the heaviest work on the road, and carries it over the summit in the Blue Ridge. From White Path to Murphy, N. C., the work will be comparatively light, and the company expects to make rapid progress with it.

Memphis & Little Rock.—The United States Circuit Court has reconsidered its former decision, and decided to appoint a receiver for this road pending further proceedings for the enforcement of its mortgage. The receiver selected is Mr. Rudolph Fink, who was formerly General Manager of the road, but for some years past has been in Mexico.

Memphis, Oxford & Columbus.—A preliminary organization has been completed of this company, which is to build the projected line from Memphis, Tenn., to Columbus, Miss., about 150 miles. The line is to pass through West Point and Oxford, Miss, and is to connect with the Georgia Pacific at Columbus. A sufficient amount has been subscribed to pay for the preliminary surveys.

Mexican Railroad Notes.—The following notes are from the *Mexican Financier* of March 22:

The International Railway, Huntington-Frisbie concession, is building steadily southward from Monclova. It will keep on in a general southerly direction until past the Paila mountains in the southern part of Coahuila, when it will turn to the westward through the fertile laguna region, passing Parras about 25 kilometers, or 16 miles, to the north, across the hacienda of Santa Isabel, striking the Mexican Central probably near Lerdo. Its course thence is undecided, but it is likely that it will keep on to the Pacific Coast at Mazatlan, perhaps by way of Durango. When it forms a connection with the Mexican Central, it is expected that the two roads will give each other a considerable amount of business.

The line for the projected railroad from the Rio San Juan to San Andres Tuxtla has been reconnoitred and found to present no obstacles whatever; its construction has therefore been decided on. There will be five stations: Las Animas, Arroya Largo, San Marcos, Santiago and San Andres Tuxtla.

Michigan & Ohio.—The Toledo (O.) *Commercial Telegram* of April 15 says: "The hearing in Probate Court yesterday in the case to assess damages arising from the crossing of the Pennsylvania road, on the east side, by the Michigan & Ohio road, was postponed until April 29.

"There are very important railroad interests involved in this movement of the Michigan & Ohio road. Their charter provides that the terminus of the road shall be on the east side. The Ohio Central has been anxious to get across the Pennsylvania road to secure connection with the belt road to the iron works, but they can only cross with the main line, not with a switch. The Michigan & Ohio has secured the right of way across the Wheeling & Lake Erie bridge, obtaining connection with the Belt road, and has been authorized to cross the Pennsylvania track, the only thing remaining to complete their programme being the question of damages.

"It is the purpose of this movement to connect with the Ohio Central on the east side, thereby giving to the latter road its needed connection with the Belt road and the iron works; also, with the Wheeling & Lake Erie, and, in fact, with the entire railroad system of the city. It virtually makes a direct line from the coal mines across Ohio and Michigan to Allegan, a combination which must prove of great advantage to both roads, to say nothing of the increased facilities which it will open up to both for connection with other roads at this point."

Milwaukee, Lake Shore & Western.—This company is making special arrangements for the accommodation of sportsmen during the coming season. The country reached by the extension of the main line abounds in game and fish, especially about Lake Gogebic. At that point the company has built a hotel which will be opened about June 1, and it is also building two hunting cars designed for the accommodation of parties which will be chartered for long or short periods at reasonable rates. Should the patronage prove large the number of these cars will be increased.

Mississippi Railroad Commission.—On the application of the Natchez, Jackson & Columbus Co., the Mississippi Court of Chancery has issued an order restraining the new Railroad Commission from interfering with that company until April 28, when the case will be brought up and argued upon its merits, but principally upon the constitutional question on the right of the state to regulate the business of the railroad companies.

Mobile & Ohio.—This company makes the following statement for March and the nine months of the fiscal year from July 1 to March 31:

	March.		Nine months.	
	1884.	1883.	1883-84.	1882-83.
Earnings	$188,899	$184,844	$1,835,805	$1,876,247
Expenses	125,000	136,383	1,149,694	1,285,590
Net earnings	$63,899	$48,461	$686,111	$590,657
P. c. of exps.	66.6	73.7	62.6	68.5

For the nine months this shows a decrease of $40,442, or 2.2 per cent., in gross earnings, and a decrease of $135,896, or 10.5 per cent., in expenses, with a resulting gain in net earnings of $95,454, or 16.2 per cent.

New York, Lake Erie & Western.—The Attorney-General of Pennsylvania has brought suit against this company to recover 25,000 acres of coal land in Elk County, Pa., which has been owned since 1874 by the company, the title being nominally in the name of P. H. Watson, as trustee. Under the Pennsylvania law of 1883, a foreign corporation is not allowed to own lands not necessary for the carrying on of its business. As the company has been in undisturbed possession of this land for 10 years, and has made improvements upon the property, it is very doubtful whether the forfeiture can be enforced. If the state is successful in this suit, it will become the owner of the property. The company also owns a large tract of coal and timber lands in Jefferson and McKean counties, and should the Elk County suit be successful, then suits will be begun in each of the other counties.

New York & Long Branch.—The taking of evidence in the suit to prevent the setting aside of the agreement for the joint use of this road by the New Jersey Central and the Pennsylvania companies was continued in Philadelphia, April 15. Assistant Comptroller Riebenack, of the Pennsylvania Railroad, continued his evidence commenced a week ago, but added very little to what has been already published. Mr. George B. Roberts, President of the Pennsylvania Railroad Co., was next examined in regard to the part he took in the negotiations for the agreement. Mr. Roberts said that in the interviews that took place the Pennsylvania was not represented by counsel, there being no reason for such a course, as it was merely an execution of an operating contract. He thought the agreement a very judicious one for all parties. The Pennsylvania Railroad Co. had fully determined to build a parallel line, and would have built it if it had not succeeded in getting the agreement for the use of the Long Branch road. The road could not have been as productive in that case and the Long Branch Co. would not have been able to pay its obligations to the Central Railroad Co. The pooling contract was an afterthought, Mr. Roberts said, and originated with Messrs. Harris and Cassatt. Like all contracts of this kind its working can only be determined after trial. Under cross-examination Mr. Roberts said that he had been informed by counsel for the Central that all legal difficulties in the way of the contract would be removed and he was also advised by them that proper action had been had from the Chancellor before the execution of the agreement. As to the apparent loss shown to have been incurred in the operation of the road Mr. Roberts thought that the statement was not correct and was of the opinion that there would have been a greater actual loss if there had been no contract.

Mr. Richard J. Dobbins testified that he was a director of the New York & Long Branch Co., and that to his knowledge the agreement of Jan. 3, 1882, had never been submitted to the board for its approval. The hearing was then adjourned for one week.

New York & New England.—The Receiver's statements give the following figures for February and the two months ending Feb. 29:

	February.		Two months.	
	1884.	1883.	1884.	1883.
Earnings	$252,513	$237,711	$499,278	$483,392
Expenses	213,159	244,445	448,300	519,232
Net or deficit	N. $39,354	D. $6,734	N. $60,978	D. $35,844
Per cent. of exps.	84.4	102.8	87.8	107.0

For the two months there was an increase of $15,886, or 3.3 per cent., in gross earnings with a decrease of $80,932 or 15.6 per cent., in expenses, making a total net difference of $96,818, or the change from a deficit of $35,840 to $60,978 net earnings.

The New York, Lake Erie & Western Co. has petitioned the Court for an order directing the Receiver to pay over a balance of about $125,000 due on freight account. The petition sets forth that this amount is due for money collected for charges on freight sent over the petitioner's road, and that it is in no sense part of the earnings of the New England road, and asks that the Court direct its immediate payment.

The Rhode Island Legislature has passed the bill authorizing this company to issue new preferred stock and also to use the remaining second-mortgage bonds in settlement of floating debt. The bill is similar to those passed in Massachusetts and Connecticut.

Oregon Improvement Co.—The title to a large tract of coal lands held by this company has been disputed. The Oregon Improvement Co. maintains that it has a contract with the Northern Pacific Railroad Co. for the purchase of these lands, but the present management of the Northern Pacific disputes that fact.

Oregon Pacific.—It is reported that tracklaying has been begun on this road at Yaquina Bay, Oregon, and that the rails have been laid to Oneatta, about six miles. A steamship loaded with locomotives, car trucks, and other material, is now on the way to that point from New York. Work is in progress on the grading of the road from Yaquina to Corvallis on the Willamette River, a distance of 70 miles. There are three tunnels on the line, one 650 ft. long, one 450 ft. long, and one 750 ft., which are reported to be nearly completed.

Oregon & Transcontinental.—At an informal meeting of the stockholders in New York, April 15, various plans for the settlement of existing troubles of the company were discussed but no conclusion was reached. Another meeting will be held shortly. It is proposed that a committee of the dissatisfied stockholders be appointed to confer with the present management in relation to a settlement.

Pennsylvania.—The track is now laid on the new Schuylkill Valley Branch from Spring Mill, Pa., to Norristown, 6 miles. The road is graded for a double track and the work of laying the second track is in progress. Between Spring Mill and Manayunk some heavy rock-cutting remains to be completed, and it will be several weeks before the track can be laid. The deep cut through Conshohocken is completed, and the overhead bridges carrying the streets of the town across the railroad are all in place. The long bridge crossing the Schuylkill is almost finished, and the track is laid from the western end to a connection with the main line at 52d street, in Philadelphia. It is expected that trains will run through from the Broad street station to Norristown by the middle of June.

Raleigh & Augusta Air Line.—The extension of this line from Hamlet, N. C., to Cheraw, S. C., has been located and contracts for the grading are now being let. The engineers are now at work on the line from Cheraw to Camden, and have nearly completed a preliminary survey. The contract requires the grading to Cheraw to be completed by next fall. The distance from Hamlet to Cheraw is about 25 miles; from Cheraw to Camden about 55 miles.

Richmond & Danville.—This company makes the following statement of operations for the six months of its fiscal year from Oct. 1 to March 31:

	1883-84.	1882-83.	Inc. or Dec.	P. c.
Gross earnings	$2,084,951	$2,048,555	I. $36,396	1.8
Expenses	1,237,977	1,323,097	D. 85,120	6.4
Net earnings	$846,974	$725,458	I. $121,516	16.7
Fixed charges	587,446	...	...	...
Surplus	$259,528	...	...	...

All expenditures for new equipment, improvements and construction are included in the expenses as given above in both years.

Richmond, Fredericksburg & Potomac.—The Virginia Court of Appeals has rendered a decision in two of the test cases brought by holders of the guaranteed stock of this company, demanding an issue to them of dividend obligations of like character with those issued to the holders of the common stock some three years ago. They claim that under the provisions of the contract made with the guaranteed stockholders they were entitled to receive these obligations. The Circuit Court dismissed the suits, but the Court of Appeals reversed the decision and sustained the claim. This decision will require the issue of about $330,000 in dividend obligations and the payment of some $25,000 in back dividends.

Rochester & Pittsburgh.—This company and the New York, Lake Erie & Western have agreed to submit the existing difficulties between them, which chiefly relate to the coal trade to Buffalo, to arbitration. The Erie Co. has named Mr. John A. Wright, of Philadelphia, and the Rochester & Pittsburgh Mr. Chauncey M. Depew, and these two arbitrators will select a third. Their decision will be final.

St. Joseph, Joplin & Gulf.—It is said that work will very soon be begun on this road, which is to run from St. Joseph southward to Joplin, Mo. The location of the road has been completed and contracts will shortly be let.

St. Paul & St. Croix.—This company has filed articles of incorporation to build a railroad from St. Paul, Minn., eastward to the Wisconsin line, a distance of about 24 miles.

Selma & Tennessee River.—This company has filed articles of incorporation to build a railroad from Selma, Ala., northward to the Tennessee line, crossing the Tennessee River near Florence. This is one of several projects for lines through North Alabama. Not more than one of them is ever likely to be built.

South Carolina.—It is reported that a controlling interest in this road has been sold to the Clyde syndicate, which owns so large an interest in the Richmond & Danville and in the Atlantic Coast Line. The officers of the company, however, profess to know nothing of the sale and say that at least the report is premature.

State Line.—This company has filed articles of incorporation to build a railroad from a point on the Pittsburgh Division of the Baltimore & Ohio in Fayette County, Pa., southward to the West Virginia line. The road is to be 26 miles long and the organization is controlled by the Baltimore & Ohio.

State Line & Sullivan.—It is announced that this road has been leased to the Lehigh Valley Co. for 50 years. The road runs from Monroeton, Pa., to Bernice, in Sullivan County, 23 miles, and the lease includes the right to use the tracks of the Barclay Railroad from Monroeton to Towanda, 4 miles. The company leases its road, but retains possession of, and will continue to work, the coal mines about Bernice. It is stated that the rental of the road is to be $36,000 a year for the first three years, with $40,000 a year for the balance of the term. The company has mined between 60,000 and 70,000 tons of anthracite coal a year, which finds its outlet over the road which is now leased and over the Lehigh Valley road from Towanda.

Texas & Pacific.—This company has sold to the Magnolia Cattle Co. a body of 33,000 acres of land in Borden County, Tex., at $3 per acre. Payment, however, was made in Texas & Pacific income bonds, whose present market price makes the actual cost of the land to the company only about $1.56 per acre. During the past month the company has made numerous smaller sales of grazing lands to stockmen on the same terms.

Texas & St. Louis.—The Receiver recently petitioned the Court for authority to make a contract with the Baltimore and Ohio Telegraph Co. for the construction of a telegraph line over this road. The Court referred the matter to a master who has reported in favor of the contract, provided the telegraph company is not given the exclusive right of way over the road, which was asked for.

Toledo, Cincinnati & St. Louis.—The shopmen and some of the trainmen on the Cincinnati Northern Division quit work April 9, because they had not received their pay. The strike included all hands except the engineers. It continued for two days, but the men finally on April 11 decided to go to work on the condition that the Receiver would pay them for February within a week, and that three men, who had been arrested on the charge of delaying the mail, should be disharged. The strike was subsequently renewed, however, when it appeared that the payment was to be made in receiver's certificates, which the men were not willing to receive. On April 16 the strike was ended, payment being made part in cash and part in negotiable orders.

The committees representing the holders of main line and St. Louis Division bonds have reached an agreement for a plan of organization combining these two divisions, which include the main line from Toledo to St. Louis. It is understood that this plan involves the issue of first-mortgage 6 per cent. bonds to the amount of $6,750,000, or $15,000 per mile, for the purpose of putting the road in good order, changing it to standard gauge and providing terminal facilities. The present first-mortgage bondholders will receive second-mortgage income bonds, St. Louis Division bonds to go in at par and main line bonds at 150. Holders of these bonds are also to receive the first opportunity to subscribe for the new issue. It is also proposed to exchange the debenture bonds for the new income bonds, and holders of income bonds and preferred stock of the present company will be given the privilege of subscribing for the preferred stock of the new company at $5 per share. Holders of common stock of the present company will also be given stock of the new company on payment of an assessment, the amount of which is not fixed. Holders of the present securities who do not join in the present organization and subscribe for the new securities will be left out altogether. The committee has prepared a circular setting forth the present condition of the road, and in it they say that the Receiver is unable to meet the daily expenses from the receipts of the road. Meantime there is nothing to provide for depreciation, and the road is already in such a dilapidated condition that without a large immediate expenditure it could probably not be operated through another winter. In the Receiver's hands the expenditures which are absolutely necessary can only be provided for by a large issue of certificates which would in a short time reach an amount more than equal to the value of the road, so that the interest of the present stock and bondholders would entirely disappear. The necessity is so urgent that the committee is assured that the Court will be willing to give a speedy order for sale, provided it is asked for by a large majority of the bondholders. It is also important, they say, to take advantage of the present very low prices of railroad material and equipment.

In regard to the construction of the road and the adoption of a narrow gauge the committee used the following strong language: * * * "And thus end the singular folly of trying to run a toy railroad through the expensive medium of a receiver, at the same proportionate expense of maintenance and operation as properties of the highest class and efficiency. Your line, running as it does northeast and southwest, continually crosses standard gauge railroads, with not one of which, without breaking bulk (which is fatal to any margin of profit) can it exchange business. The Toledo, Cincinnati & St. Louis so-called system crosses in all about 100 standard-gauge railroads, with all of which, by the folly or mistaken judgment of its projectors, it is out of key and harmony, and unable to offer and receive business except on conditions so disadvantageous that any attempt to handle it causes great loss. A condition more ignominious and disastrous it would be difficult to conceive."

It is announced that assents to the committees' plan will be received at No. 24 Congress street, Boston, and at No. 81 Beaver street, New York, every day during business hours up to May 10, which, owing to the great emergency of the case, is the extreme limit of time which the committee feel justified in fixing to allow the bondholders to participate in the new organization.

Union Pacific.—This company makes the following statement for February and the two months ending Feb. 29, including the leased and controlled roads:

	February.		Two months.	
	1884.	1883.	1884.	1883.
Earnings	$1,547,908	$1,673,224	$3,086,876	$3,590,078
Expenses	1,201,018	1,007,454	2,506,382	2,026,576
Net earnings	$346,950	$665,770	$580,494	$1,563,502
Per cent. of exps.	77.6	60.2	81.2	56.5

For the two months this shows a decrease of $503,202, or 14.0 per cent., in gross earnings; an increase of $479,806, or 23.7 per cent., in expenses, and a resulting decrease in net earnings of $983,008, or 69.2 per cent.

The Land Department reports that during the three months ending March 31, 580,756 acres of land were sold for $1,419,386. The sales during March amounted to 332,924 acres, or over one-half the total reported for the quarter. During March 510 emigrant teams went West from Council Bluffs, and 404 cars of household goods were carried over the road.

Wabash, St. Louis & Pacific.—It is said that this company will soon begin work on the extension of its Quincy, Missouri & Pacific Division from Trenton, Mo., to St. Joseph. Surveys for this extension were made some time ago and the company is now asking the people along the line to give the right of way.

Steel rails are being laid on the branch from Lexington to St. Joseph, the track of which has been in very poor condition.

Reports have been in circulation in New York that the company would default on the June interest on its bonds, and also that arrangements have been made for the appointment of a receiver. Both these statements, however, are denied by the officers of the company. A meeting of the board was held in New York, April 14, but it is stated that the matters under discuesion referred entirely to measures for securing greater economy in the management.

Wisconsin Central.—This company has let the contract for the entire grading of its new line from Chippewa Falls, Wis., to St. Paul, Minn., to Wells, Harrison & Green, of Milwaukee and Chicago. The distance is about 100 miles, and there is a great deal of heavy work on the line. The contract requires the grading to be completed this year.